

Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

Reserve
aGV199
.5
.057

project record

Practices & Problems in Trail Maintenance & Construction

ED&T 2103

TRAIL CREW SUPPORT EQUIPMENT

JANUARY 1972

U. S. DEPARTMENT OF AGRICULTURE
NATIONAL AGRICULTURAL LIBRARY
RECEIVED
JUL 11 1979



USDA ■ Forest Service Equipment Development Center ■ Missoula, Montana

NO. 7271 2205

AD-33 Bookplate
(1-68)

NATIONAL

A
G
R
I
C
U
L
T
U
R
A
L



LIBRARY

Information contained in this report has been developed for the guidance of employees of the Forest Service, U. S. Department of Agriculture, its contractors, and its cooperating Federal and State agencies. The Department of Agriculture assumes no responsibility for the interpretation or use of this information by other than its own employees.

The use of trade, firm, or corporation names is for the information and convenience of the reader. Such use does not constitute an official evaluation, conclusion, recommendation, endorsement, or approval of any product or service to the exclusion of others which may be suitable.

PROJECT RECORD

PRACTICES AND PROBLEMS IN
TRAIL MAINTENANCE AND CONSTRUCTION

ED&T 2103

TRAIL CREW SUPPORT EQUIPMENT

U.S. DEPT. OF AGRICULTURAL
NATIONAL AGRICULTURAL LIBRARY

By

JUL 30 1980

JERRY OLTMAN

FORESTER

CATALOGING = PREP.

JANUARY 1972

USDA - Forest Service
Equipment Development Center
Missoula, Montana

PRACTICES AND PROBLEMS IN
TRAIL MAINTENANCE AND CONSTRUCTION

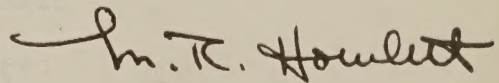
ED&T 2103

TRAIL CREW SUPPORT EQUIPMENT

FOREWORD

This Project Record provides the reader with the opportunity to visualize the Forest Service's current trail maintenance and construction procedures in some of our western Regions, if not Service-wide. It does not, nor was it intended to, provide ultimate solutions to a complex multitude of problems. The study objectives were to identify problems and obtain suggested solutions from those most closely confronted with the problems. Follow-up on the individual project report recommendations is anticipated in FY 73.

I hope that after reading this project record, those of us who do not have the opportunity to actively confront day to day field problems such as reported, will be stimulated to call on our own experience and expertise to suggest solutions and alternatives for consideration.



M. R. HOWLETT

Director, Division of Engineering

CONTENTS

	<u>Page</u>
FIGURES	111
I. INTRODUCTION	1
II. STUDY PROCEDURE	3
A. Preliminary Efforts	3
B. Interviews	3
C. Field Observations	4
D. Analysis of Data	4
E. Ideas for Alternative Solutions	4
III. RESULTS	5
A. Methods of Operation	5
B. Problem Areas and Ideas from the Field	22
IV. DISCUSSION	47
V. CONCLUSIONS	48
VI. RECOMMENDATIONS	50
APPENDIX A - INTERVIEW QUESTIONS	52
APPENDIX B - PERSONS INTERVIEWED AND PLACES OBSERVED	55
APPENDIX C - PERTINENT EXCERPTS FROM INTERVIEWS (SYMPTOMS OF PROBLEMS)	57

FIGURES

	<u>Page</u>
1. Decker packsaddle	7
2. Sawbuck packsaddle	7
3. Typical panniers constructed of plywood, canvas, leather, or metal; used with Sawbuck saddle	8
4. Mantaed loads slung from Decker packsaddle	9
5. Tool carrier	11
6. Crew removing downfall	11
7. Two types of mule graders	12
8. Crew at an overnight campsite	14
9. Cooking on sheepherder's stove	14
10. Lumber rack made for Sawbuck packsaddle	16
11. Trail plow with reversible share	18
12. Trail grader used in construction	18
13. Aluminum pack frames and nylon bags	21
14. Trail crew backpacking all equipment	21
15. Typical array of lightweight camp equipment	23
16. Lightweight nylon tent	23
17. Horse packable wheelbarrow	27
18. An example of brushing tools	27
19. Combination tool	28
20. Pull apart crosscut saw	28
21. Rotary brush mower	29
22. Pack boxes used in camp	33
23. A specialized shelter	33
24. Modular animal packing concept	36
25. Extra wide cinch	36
26. Hard-faced shoes	40
27. Plastic horseshoes	40

I. INTRODUCTION

During the early 1950's, the Forest Service embarked on a development program to mechanize trail construction and maintenance operations. For this, the Equipment Development Center (MEDC) at Missoula, Montana, was given project allotments over the following approximate 20-year period to develop equipment that would meet the objectives of trail mechanization. Significant savings were anticipated if pack transportation and hand oriented methods could be replaced with motorized transportation and tools. However, the results of these projects stimulated very little implementation by field personnel. The reasons for this are many but such factors as a reluctance of people to change from the old ways, the small volume of business for this specialized equipment, the Wilderness Act of 1964, and the changing values of the American public were probably the most significant.

In the fall of 1970 an ad hoc committee was formed to review MEDC's work on trail equipment and make recommendations. The committee advised that attempts to mechanize trail activities should be deemphasized and consideration should be given instead to equipment that can improve current nonmotorized field practices. They further suggested that a problem analysis should be made to determine if and where equipment used at the present time could be improved. Such a study was subsequently carried out during the 1971 trail season and is the subject of this report.

The objectives of the study were: (1) to identify the problems relating to present-day trail activities that could be improved with better equipment, and (2) to gather ideas concerning equipment and subsistence that were suggested by field personnel.

Briefly, this report concludes that:

1. Handtools are relied upon for completing most tasks.
2. Gasoline-powered chain saws and rock drills are used effectively but powered handtools applicable to other tasks are not being used.
3. Few improvements have been made on horse drawn equipment in recent years. Operators and animals are available only in isolated cases and outside of trail grading, available horse drawn equipment has limited application.
4. The type of camp equipment, tools and food commonly used today necessitates animal transport. Extremely lightweight equipment and foods are available but they are not being used or field tested.
5. Packers are gradually disappearing from the ranks of Forest Service personnel.

6. Economic measures do not exist which can be used to determine the trail system's value. Consequently, the amount of maintenance cannot be realistically planned, trails are not being programmed for reconstruction, and equipment development costs and benefits cannot be projected intelligently.
7. Trails are of low priority in most National Forest programs.
8. The burden for solving equipment needs is being transferred to the contractor in Regions 3 and 6.
9. Improvements in camping equipment, tools and packing systems would benefit wilderness programs, contractors and the commercial packing industry as well as engineering trail crews.

Based on the data, the analysis and the conclusions, the following recommendations were made:

1. Technical information on handtools should be provided to the field on procuring, servicing and operating handtools. Also, the feasibility of improving handtools should be investigated.
2. Powered handtools for brushing, repairing tread and creating drainage should be evaluated.
3. Although little emphasis should be given to horse drawn equipment, the Los Padres grader should be evaluated from a mechanical engineering viewpoint and evaluated for Service-wide use.
4. Military and contemporary outdoor recreation equipment should be integrated into trail crew support equipment.
5. A simplified contemporary animal packing system should be taken through the prototype stage of development for evaluation.
6. Backpack trail maintenance crews should be organized and evaluated over one or more seasons.
7. New methods of controlling stock outside of fenced areas should be investigated.
8. Commercially available plastic horseshoes should be evaluated.
9. Administrative consideration should be given to the production of a professional quality training program on trail maintenance.
10. Development projects should not be initiated without some assurance that the crews can afford to implement the results.

II. STUDY PROCEDURES

A. Preliminary Efforts

With the start of the study, several sessions were held to develop a comprehensive list of questions for the study to consider. Development Center personnel, National Forest administrators, and one commercial packer were involved in these sessions. The lists of questions were then categorized to be used by MEDC representatives as an initial line of questioning. These questions were revised as the study progressed with the result that irrelevant or unproductive questions were cast aside. The revised battery of questions, including those added during the course of the study, are listed in Appendix A.

A preliminary report outline was prepared to lend perspective to the study and show how the data would be used. In an attempt to familiarize MEDC representatives with the techniques and terminology used in connection with pack and saddle stock, a 3-day session on animal packing was conducted. A general presentation on backpacking was given for the same purpose.

B. Interviews

Personal visits were made to Regions 1, 3, 4, 5 and 6. In total, 34 people were formally interviewed (see Appendix B). This included eight District Rangers, eight fire control officers, four packers, four technicians, three forest engineers or their assistants and three foresters. With the exception of Regions 1 and 4, all places visited within a particular Region were left up to the Region's discretion.

It was desirable that as many trail people as possible be contacted during the field season and preferably those working. Because the season is short, an attempt was made during March and April to develop and perfect an interviewing technique. A technique employing a tape recorder was chosen to permanently record all information for constant analysis during the study. Available Forest Service personnel within a reasonable travel distance of Missoula were contacted for interviews. This initial information led to more detailed in-depth interviews later in the study. After five preliminary interviews were successfully carried out, a summer schedule was planned.

The persons interviewed during the study were individuals directly engaged in trail work. This included crew members as well as District Rangers. A description of their operation along with their needs, views and suggestions as they pertained to trail crew support equipment were solicited and are recounted in Section III, RESULTS. Twenty-two hours of tape recorded information and a complete set of transcriptions are on file at MEDC.

C. Field Observations

To more completely visualize the problems associated with trail work and to verify information obtained during the interviews, some time was spent working with several trail crews. As time permitted, MEDC representatives traveled with, and performed many trail tasks alongside crew members. Five packers and 16 trail crewmen were observed in this manner. Photographs were taken on pack saddlery, packing operations, camp equipment, trail conditions, handtools, horse drawn graders and plows, horse handling facilities, etc. These observations were used in conjunction with the tape recorded information.

D. Analysis of Data

By listening to the tapes, and reading the transcriptions, problems and symptoms of problems became quite apparent as people talked. Short excerpts of these symptoms are tabulated in Appendix C. From this rather extensive list, 12 problem statements were written and are found in Section III, RESULTS, Part B, Problem Areas and Ideas From the Field.

E. Ideas for Alternative Solutions

One of the objectives of the study was to solicit ideas from field personnel. The ideas found are listed in Part B of the RESULTS, following each problem statement. They provide some of the alternative solutions that might be considered in solving the problem. Some of the ideas were illustrated to provide clarity.

III. RESULTS

A. Methods of Operation

The investigation found that Forest Service trail crews in Regions 1, 3, 4, 5 and 6 could be categorized into one of four basic methods of operation. These methods briefly defined are:

Packer and 2-man crew moving together using pack and saddle stock.

Packer and crew (3-10 men) moving independently.

Two-man crew moving with the aid of pack animals (no packer).

Two-man crew backpacking all equipment with dependence on a packer for occasional resupply.

All of these methods are tied closely to pack and saddle animal transport. The packer is extremely important to the total operational success on most Districts. In many cases he is the key person around which the operation revolves.

1. Packer and Two-Man Crew Moving Together Using Pack Stock and Saddle Horses

a. Crew Organization

This is probably the most common method when the workload is large enough to hire a full-time packer. A 5- or 10-day work schedule is used depending on the planned route of travel. Ten days on the job is usually used to reduce time for travel from duty station to worksite. Loop trips planned to start a crew from a road and end at a road are used whenever possible. To accommodate all of the equipment used by the crew, six or more pack mules are used. A bell mare is included and packed but with a lighter load. A saddle horse for each member of the party is usually included.

The packer is often the most experienced member of the crew and is called upon to make supervisory decisions in addition to packing supplies and caring for the stock. Once the trail crew leaves the road end, the packer may or may not accompany the rest of the crew at the same pace. He will either move the animals and equipment forward to the intended campsite or work on trail maintenance tasks as they progress along the trail. In either case he assists in determining what maintenance needs to be done.

b. Travel on the Trail

Either the Decker or Sawbuck packsaddle (figs. 1 and 2) will be used for packing the equipment used by the crew. Which saddle is used will often depend on the packer, local tradition, or what is available on the District. Generally speaking, the Decker saddle is used in Regions 1, 6, and parts of 4. The Sawbuck saddle is found throughout Regions 5, 3, and parts of 4. When the Sawbuck saddle is used, some type of pack bag or pack box (pannier) (fig. 3) is preferred. The Sawbuck can be top loaded with additional equipment using one of several kinds of hitches and different lengths of ropes (fig. 4a). The Decker saddle needs less specialized accessories. Canvas tarps (mantas) are usually used in place of the panniers to contain the loads. Ropes are used to bundle and sling the loads from the D-rings (steel crossbars) of the saddle (fig. 4b).

When using mantas, each bundle has to be unpacked to get at items within. Consequently, most loads are packed and unpacked each day. The panniers allow access to items more easily. Objects of large and/or odd size can be carried on the Decker but not always in the panniers. A skilled packer using the Decker saddle can load or unload in about the same time as another packer using the Sawbuck saddle and panniers.

The packer generally takes great pains to ensure the loads on both sides of the packsaddle are balanced. If either packsaddle is top loaded, then additional steps are needed and extra pack equipment in the form of ropes, cinches, etc. are used.

The shoeing of stock in the field is usually done only on a need basis. If any shoeing has to be done the packer will usually try to accomplish this after the animals are unloaded and in the camp area. A packer insures that he has extra shoes, nails, and shoeing tools along. It is generally a requirement that a packer know how to shoe his stock correctly. Excellence in shoeing, however, comes only after years of experience. Shoeing in the field permits packers to use only the basic tools and methods.

c. Work Tasks

During the forward movement of the crew, their work tools are usually carried by one of the pack animals. These could include a chain saw, crosscut saw, bow saw, pruning saw, brush axe, brush knife, weed cutter, pruning shears, pulaski, pick, pick-mattock, grub hoe, shovel, axe. In order to make



Figure 1.--Decker packsaddle.

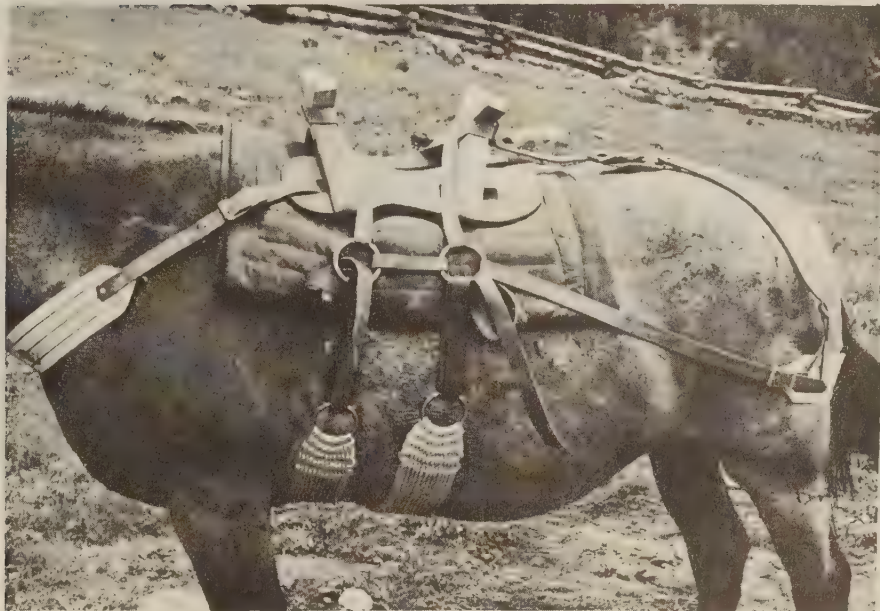


Figure 2.--Sawbuck packsaddle.

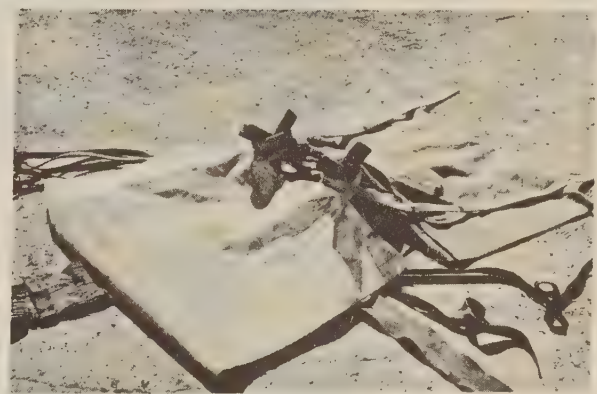
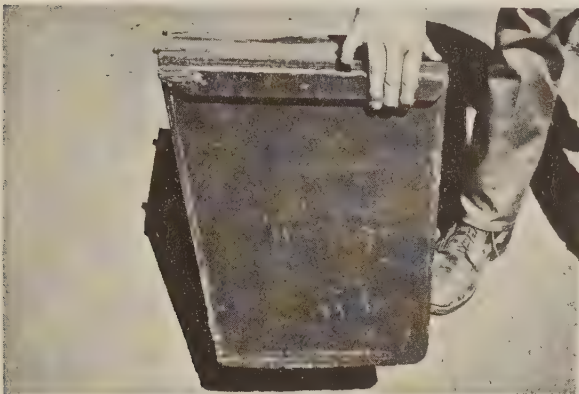
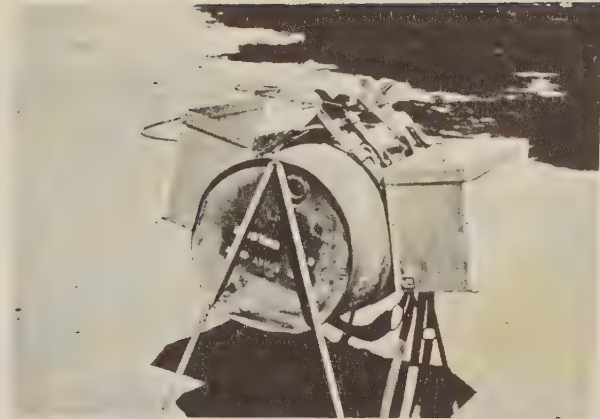


Figure 3.--Typical panniers constructed of plywood, canvas, leather, or metal; used with Sawbuck saddle.

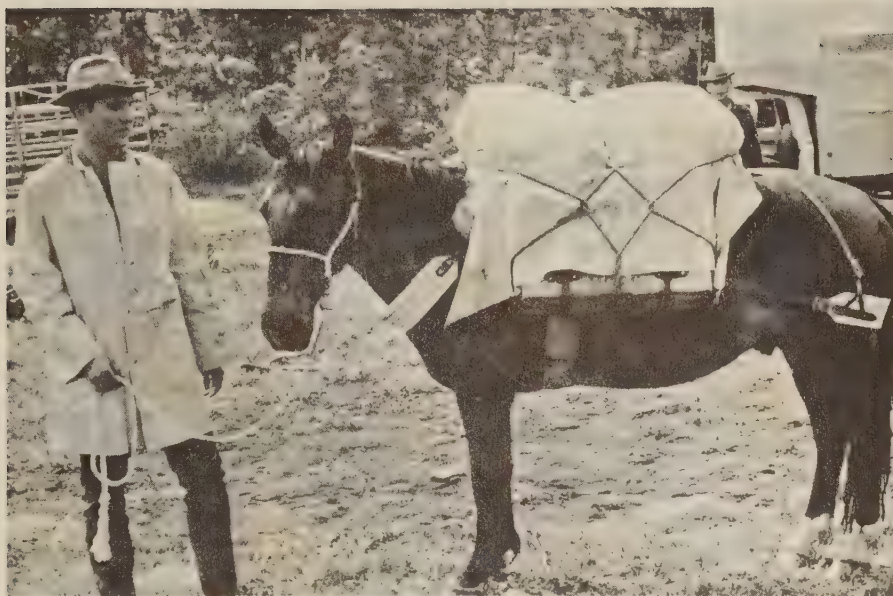


Figure 4a.--Sawbuck with top load and double diamond hitch.



Figure 4b.--Mantaed loads slung from Decker packsaddle.

access to these tools relatively easy, a tool carrier of some nature, such as shown in figure 5, is used. It is constructed such that it will be mounted on a packsaddle.

In many cases a pack box on one side of the animal will contain a chain saw, chain saw gas and oil, and miscellaneous chain saw parts. On the other side will be a box to balance the load which contains extra chain saw gas, possibly a radio, axe, shovel, pulaski, brush knife, etc. This pack animal will be led by the second member of the crew as they travel down the trail. The saddle horses will be tied behind the pack mule, while the crewmembers move along on foot. When a major obstacle such as a log lies across the trail, the men will usually tie up the lead animal, detach the chain saw or other type of handsaw from the pack box, saw through the log, and remove the dismembered section of the log from the trail (see fig. 6). Once they are again in motion, both crewmembers will carry some type of brush knife or brush axe, using it to clear brush and limbs as needed to the correct trail width. Overhead limbs are either removed with the tool in hand or with the use of long handled pruning shears or pruning saw. Young trees which are becoming an obstacle to pack train travel are felled and scattered off to the side of the trail.

Rocks over a few inches in diameter are removed from the trail tread either by kicking or rolling by hand. Water dip or water bar repair is accomplished with such handtools as shovel, pulaski, or grub hoe. The crew may also bring in a horse drawn trail grader such as shown in figure 7. It is used primarily on trails which have little exposed rock. Soil sluff on the trail tread can be removed more rapidly with a grader than with handtools. The packer is usually the person most experienced with stock; consequently, he is the one most often called upon to use the trail grader. It is necessary that a harness and singletree accompany the grader. If the grader breaks apart for packing, the harness and packsaddle are placed on one animal and the grader is loaded on the packsaddle.

If the crew is moving in the direction of the campsite, they will work until they arrive or until such time that they must stop work for the day. When this happens and they are some distance from the campsite, they will generally ride their saddle horses the remaining distance.

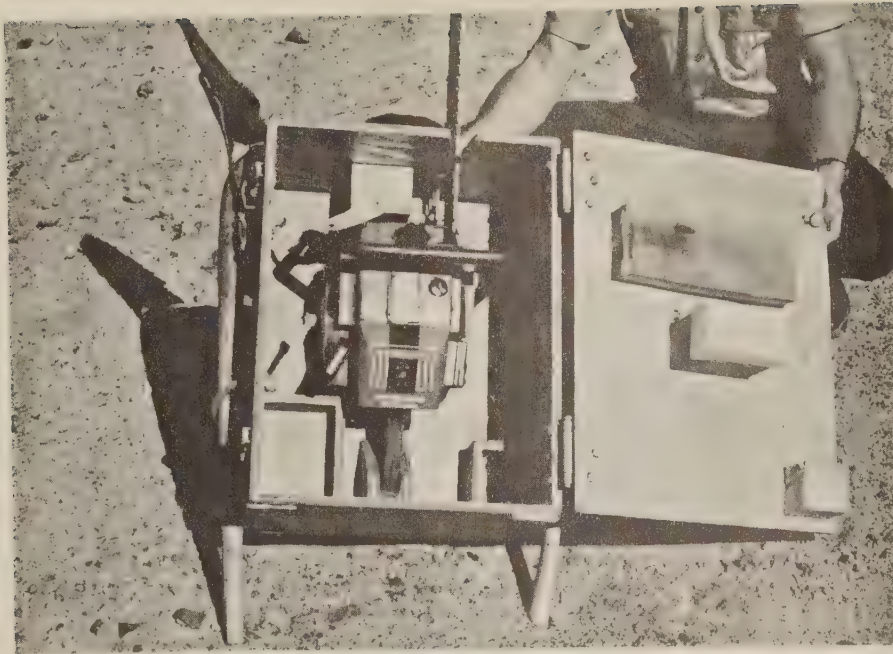


Figure 5.--Tool carrier.



Figure 6.--Crew removing downfall.

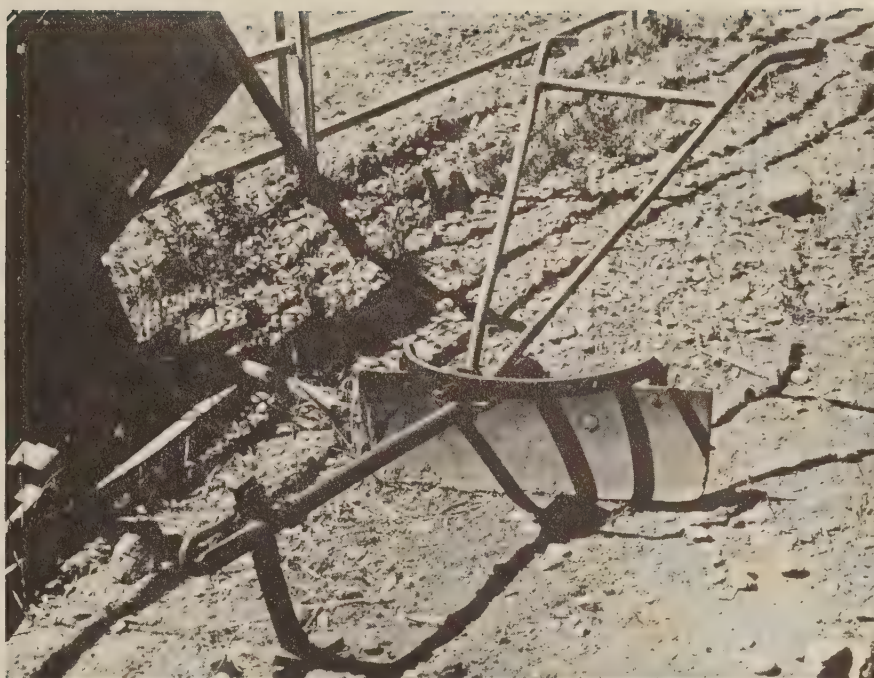


Figure 7.--Two types of mule graders.

Should the crew be in an area which does not lend itself to perpetual movement of the complete camp, they will remain in a location for the necessary number of days to complete the work. In this case, the packer will work with the crew radiating out from the campsite to a point where they must stop for the day. Then they will probably return to camp via horseback. If the crew is going to move the complete camp and work the trail forward, the two crewmembers will start out first in the morning, working as they go. The packer will collect the camp equipment and load it onto the pack animals. He will then move up the trail until he catches the crew or move on to the new campsite. If the packer stays with the trail crew, the three men will then work at trail tasks as required. At this time the loaded pack mules will be moving in a stop and go manner and in some cases will carry their loads during the full day.

d. Camp Life

The crew generally searches for a camp spot that will have available horse feed and easy access to water. A location within a few hundred feet of water is quite desirable. Campsites may have to be used despite heavy mosquito infestations.

Since this type of crew is moving constantly, breaking camp every day or every few days, they travel with a minimum amount of equipment. When a campsite is chosen, a shelter may or may not be set up. If the procedure for erecting a tent is complex or time consuming they will not use it unless the weather is adverse. In place of the large tent, many crews erect a canvas fly for protection from sun, dew, rain, etc. Mantas will be used to cover gear at night, for sleeping cover, or ground cloths. The crew will generally sleep on the ground (fig. 8) unless they are in the type of country where snakes or other factors may be a hazard. Warm sleeping bags are carried during the early and late parts of the season or while traveling in high elevation country.

A wood burning stove such as the sheepherder's stove in figure 9 or a portable gasoline fueled stove will be used for cooking breakfast and dinner. In cool and cold weather the wood burning stove is used for warmth as well as for cooking.

Other types of equipment which may be used around the camp area are: nesting aluminum cooking pots, cast iron or steel frying pans, cast iron Dutch oven, spatula, serving spoons, silverware, cups, plates, bowls, washbasins, canvas water buckets, etc.



Figure 8.--Crew at an overnight campsite.



Figure 9.--Cooking on sheepherder's stove.

When no corrals, natural barriers or drift fences are available for controlling stock at the campsite, the packer will usually hobble all of the horses and turn the mules loose. Oats or commercially prepared pellets of some grain mixture will be used to catch the stock and as an enticement for them to stay near the campsite. If natural grass is available in the area, the packer will simply let his animals graze loose. However, if grass is scarce the stock may have to be moved to another location. They will be allowed to graze for a time and then taken back to the camp area and tied to trees for the night. Sometimes it is necessary when tying overnight that the packer arise early, about daybreak, and release his stock to graze before the day's work starts. Rarely is a complete horse diet carried with the crew. The weight and bulk prohibits bringing more than a few days' rations.

2. Packer and Crew (3-10 men) Moving Independently

a. Crew Organization

This arrangement is used in both maintenance and construction work. There are often five or more men during heavy construction projects but usually three men are considered ideal in trail maintenance. The packer is not considered a trail crewman and is used to transport all equipment to the designated camp or work area. After a camp is set up, the crew will remain there until the job is finished or they have progressed so far up the trail to make continued use of the camp uneconomical. The packer resupplies the camp periodically and moves the equipment to a new location as desired. Ten-day work periods are usually considered most efficient if the travel time from work area to Ranger Station is long. The packer will go in with the crew and return with the empty saddle horses. He may bring saddle horses into the crew at the end of the work period for transportation to the road end.

b. Travel on Trail

The kind of animal packing equipment and methods used are basically the same as described earlier. A packer may take as many as nine pack mules at one time. If he is supplying a construction crew, he will often be packing odd sized objects such as pressure treated timbers, metal culverts, cement, sand and gravel, bridge cables, dynamite, etc. In an attempt to meet these job requirements, District personnel have modified the packsaddle in some fashion. For example, racks have been built for carrying lumber which attach to the saddle (fig. 10).



Figure 10.--Lumber rack made for Sawbuck packsaddle.

Saddle horses will be used to bring the crew to the camp area whenever possible. The packer then takes the empty saddle horses back out. The crew will notify the packer when they are ready to move their camp or he will do it by a prearranged schedule. Maintenance crews may move as often as once each week while construction crews may remain in one camp for more than a month.

c. Work Tasks

Travel between camp and the worksite will be on foot. Tools are either hand carried each day or left at the worksite. The maintenance tasks will determine what tools are needed and these tasks will generally be those described earlier.

During trail construction, brush is cleared from the right-of-way with a chain saw whenever possible. Otherwise hand-tools such as a pruning saw, brush axe, brush knife or pruning shears are employed. Stumps are removed with dynamite. In Region 5 a trail contractor had successfully used a draft horse and block and tackle to jerk out brush and tree stumps.

Trail tread is commonly built by hand but horse drawn trail plows or graders will be employed under ideal conditions. The pulaski, McLeod fire tool, grub hoe, pick, and pick-mattock are the tools most often used. Trails that are constructed with the aid of horse drawn equipment usually begin with a scratch line built by hand. This is done by scraping a line on the sidehill just large enough for a mule to walk on. A trail plow (fig. 11) may then be pulled along this path to rip out and lay back a wider path from the sidehill.

A technique which has been successfully used in R-5 on the Los Padres National Forest involves the use of a mule drawn trail grader. This grader (fig. 12) is a scaled down version of a single-wing ditcher used to construct irrigation canals on the contour. From a scratch line, about four passes are needed to produce a trail of the desired width.

In both trail construction and restoration during maintenance, barrow is often needed. Barrow will be brought to the restoration site by pack animal using wooden boxes attached to the saddle, by a horse drawn "slip", or by a two-man stretcher type carrier.

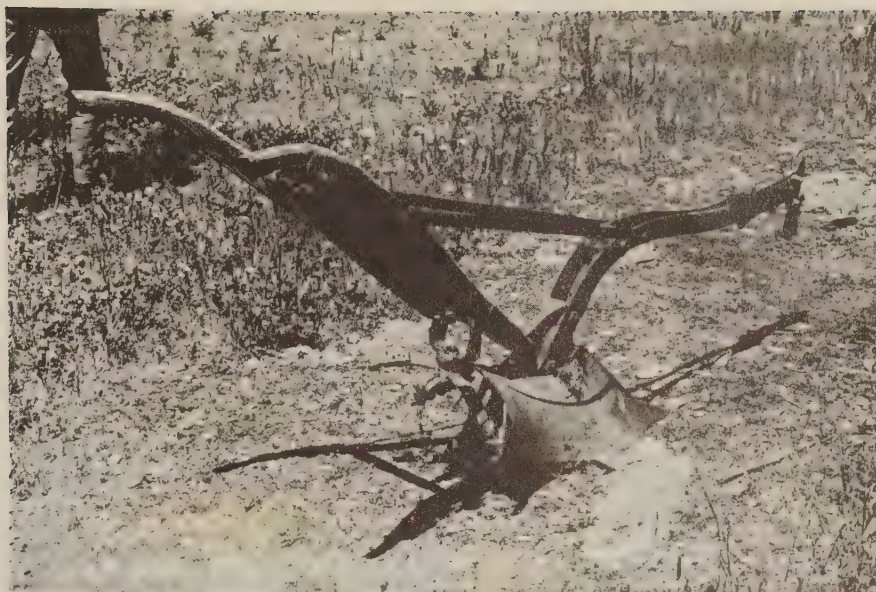


Figure 11.--Trail plow with reversible share.



Figure 12.--Trail grader used in construction.

d. Camp Life

The camp area will contain one or more tents depending on the number of men. One tent may be erected for cooking and storage and another for sleeping. The standard Forest Service wall tent is very commonly used. A canvas fly will occasionally be installed in place of the cook tent when the crew is as small as three men. Collapsible wood and canvas cots are often used, although air mattresses or foam pads are occasionally substituted. Sleeping bags may be furnished by the District but often the crewmember prefers to use his own personal bag.

Propane is often used as a cooking fuel in this type of camp. It provides a simple and fast supplement to the wood burning stove. A three burner propane stove is the most popular. During early morning this stove may also be lit to take the chill out of the tent. The wood burning stove is also used as a tent heater and in the case of the Kimmel camp stove, provides an oven for baking and roasting.

Occasionally a portable propane fueled refrigerator as well as propane lights may be used in the camp.

Often the camp utensils are very similar to that described earlier, although more implements will be included, such as folding tables, chairs, or stools.

The crewmembers will bathe as often as once each day if the facilities are available. A dam may be built on a stream to hold a pool of water or a lake may be used.

Fresh meats and some vegetables have to be used within 2 or 3 days unless refrigeration is provided. Canned goods are used to supplement these fresh foods and relied upon entirely after they are gone. In desert areas and during mid-summer heat, food may not keep even 3 days without refrigeration. Very little fresh food is used under those conditions and canned food is relied upon quite heavily. Fresh bread will keep for some length of time and is commonly used every day for sandwiches at noon. When the crew is small they are paid per diem and they buy whatever food they want. Generally this food is bought during their time off, such as during their 4 days' break. The food is then brought into camp by the packer.

Generally the packer will stay in camp for only a short time. He may, on occasion, spend the night with the crew and leave the following day. The stock is cared for in the manner described earlier.

3. Two-Man Crew Moving with the Aid of Pack and Saddle Stock;
(No Packer)

The crew is composed of two men who move together and transport their tools, camp equipment, and food with pack stock. One of the men may have packing experience, but generally this arrangement exists when funds are not available to employ a fully qualified experienced packer. Their packing techniques and equipment may be what they have worked out themselves or have learned in a short training session with District personnel. The packsaddles and basic accessories are generally the same as described earlier.

They will move their camp daily if possible and perform maintenance as needed on the trail. Their movement along the trail would be very similar to that described under the first category with the exception that all of the pack and saddle stock accompany them. The work tasks, tools, and camp equipment are all very similar to what has been mentioned in the first description. Generally the amount of food and personal gear is less and fewer pack animals are needed, consequently.

4. Two-Man Crew Backpacking all Equipment with Dependence on Packer
Only for Periodic Resupply

a. Crew Organization

This crew, usually two men, is mostly set up to do light maintenance. They move on foot, can be self-sustained for up to 7 days, and carry all of their equipment by backpack. A packer may be used to resupply them with fresh meats and vegetables, etc., every 5 days or so, or they may work on a daily basis from a pickup truck.

b. Travel on the Trail

They may use lightweight aluminum pack frames with nylon pack bags (fig. 13) to transport their tools, camping equipment, food, etc. Often they move their camp every day, carrying all of their gear with them as they work the trail (fig. 14). The total weight carried by each man may vary from 50 to 80 pounds. They may either work together on the trail performing the maintenance tasks as needed, or one man will take out ahead to determine the length of time and the amount of work involved in the next section of trail. He will carry forward one of the packs, usually a larger share of the weight, and leave it at a campsite. Then he will work at the larger tasks until the other crewmember catches up.



Figure 13.--Aluminum pack frames and nylon bags.



Figure 14.--Trail crew backpacking all equipment.

c. Work Tasks

They are usually equipped with the necessary tools to accomplish the maintenance requirements described earlier. But the tools are selected on the basis of versatility, overall need, and weight. They may carry fewer tools than the crew directly supported by pack mules, but generally these tools have been of the same design. The crosscut and bow saws are usually used in place of chain saws. If a crew of this type is working from the end of the road on daily maintenance trips, no camping equipment or food is carried. Then the chain saw may be carried strapped to the pack frame.

d. Camp Life

The camp equipment is mostly selected for its compactness and light weight. An example of most of this equipment can be seen in figure 15.

Tents will be small (fig. 16) and of lightweight nylon cloth. If a tent is not used, then a waterproof fly of similar material will be carried. The ground cloth is also of lightweight, waterproof material. Down-filled sleeping bags are usually used because of their light weight and compactness. Three-quarter length air mattresses or small polyurethane foam sleeping pad may also be carried.

Cooking utensils are limited to a few items of small size and light weight. An individual may carry two nesting aluminum pots, a cup, spoon, a small frying pan, a small stainless steel grill, and a small single burner liquid fuel stove.

Dehydrated food is used predominately. Freeze-dried products are the most popular. When the crew is resupplied by pack string, they will receive a few days' rations of fresh food.

B. Problem Areas and Ideas from the Field

The problems found to be relatively Service-wide are contained in 12 statements, each followed by a short discussion. Alternative solutions or ideas suggested by field personnel concerning these problems are also listed.

1. Problem: Tools

a. Statement

A wide variety of handtools are used for trail work and many people feel that these tools can be improved, but few had



Figure 15.--Typical array of lightweight camp equipment.



Figure 16.--Lightweight nylon tent.

ideas to offer on what these improvements might be. Restrictions on the use of motorized tools in wilderness and primitive areas preclude their use on many miles of trail. Horse drawn tools could be used in some situations but skilled operators and properly designed implements do not exist on a Service-wide basis.

Handtools are simple in design, durable and easy to maintain. They require little operator training and proficiency comes quickly with use. Significant substitutes or improvements may be difficult to find.

b. Discussion

Attempts to retain old methods, such as the use of the cross-cut saw, have been only partly successful. The problem stems from the difficulty in obtaining personnel that like to live in remote areas and use a tool that they know is inefficient by modern standards.

On most Districts, clearing downfall from trails is a high priority reoccurring task. Chain saws cannot be used in some cases because of policy restrictions, but logs can be cut rapidly when they are used. For reliability, a new chain saw is often purchased each year for trail crew use.

When crosscut saws are used rather than powersaws much more time and energy is required. On the west coast some logs are so large that several man-days can be required to cut them out. Crosscut saws have a long life but they must be sharpened correctly for various timber species and wood conditions. Efficient operation and proper filing (sharpness and set) require personal desire and several years of experience. Experienced crosscut operators are not available for hire. The demand for crosscut saws is down; consequently, specialized crosscut saws are hard to find on the commercial market. People have been searching unsuccessfully for an alternative to the crosscut. Many do not like the present bow saws but they feel the concept has promise.

The removal of encroaching brush from trails is a constant task for all trail crews. The work is slow and monotonous and growth retardants are not used because of restrictions. The importance of brushing out trails on wet sites is equal to that of logging out, but the need for brushing trails diminishes at higher elevations. Brush grows surprisingly fast in some arid areas.

Limbing is considered part of the brushing job.

Annuals can be cut with various types of lightweight "swing" tools and larger woody plants require heavier weight or hook type tools.

Personnel are continually searching for better brushing tools. They believe that existing tools are not efficient because stooping over, rocky soils, rock outcrops, stumps, and large woody stems hinder efficient operations. Few, if any, of the tools presently in use have been designed for Forest Service trail needs; few, if any, powered handtools exist for this purpose.

Many miles of trail are lost or become a hazard to travel because much of the soil has eroded from the tread. This condition which has resulted from excessive grades and improper drainage creates an unmanageable maintenance situation. A large percentage of Forest Service trails have just evolved over time and were never designed or constructed to any standard. Water bars and drainage dips used to get the running water off the trail are built and maintained with handtools.

Preserving the trail tread by protecting it from erosion is of primary concern to regional trail coordinators and engineers, but "just getting through" often becomes the criteria for District personnel because of the number of miles to be maintained, the trail condition, the dollars available, and the inability of some crews to recognize what needs to be done. Tread maintenance is often deferred because logging out and brushing are higher in priority and require all available funds. In arid zones, effective soil compaction during tread construction often cannot be obtained because of a lack of soil moisture. Few techniques have been worked out for effectively anchoring a trail on steep hill-sides. The cost is often high when soil is lacking and it is deemed necessary to transport it. In areas where rock or soil sluffing is prevalent, a large labor effort is annually directed at opening the trails to safe passage. This type of maintenance is commonly done with a grub hoe, pulaski, or shovel.

The art of using horse drawn equipment is not being perpetuated. Experienced operators are essential but increasingly difficult to find. Frequently the grading equipment is not adapted for the job. Those who are not experienced with draft animals view the operation as being very primitive and usually prefer to do the job some other way.

Tasks cannot be completed unless the crew is on foot. Otherwise they do not catch the little things that can start

erosion. On the other hand, long stretches of trail are often traveled where maintenance is not deemed necessary.

Often the crew does not know what maintenance problems lie ahead. As the crew moves up the trail, there can be a tendency to overlook some tasks because tools are located inconveniently along the entire pack string or left at the camp if the string is not along. Most Districts have attempted to handcraft a tool carrier for use with the Decker or Sawbuck packsaddle. Some have been more successful than others. Generally, however, effective man and animal packable tool carriers are lacking.

c. Ideas from the Field

- (1) Horse packable wheelbarrow (see fig. 17).
- (2) Better brushing tools (see fig. 18).
- (3) Combination tool (see fig. 19).
- (4) Improve carrying aspect of crosscuts (see fig. 20).
- (5) Los Padres mule grader (see fig. 11).
- (6) Rotary powered brush cutter (see fig. 21).
- (7) Hedge Trimmer type brush cutter.
- (8) Design a device for gathering telephone wire.

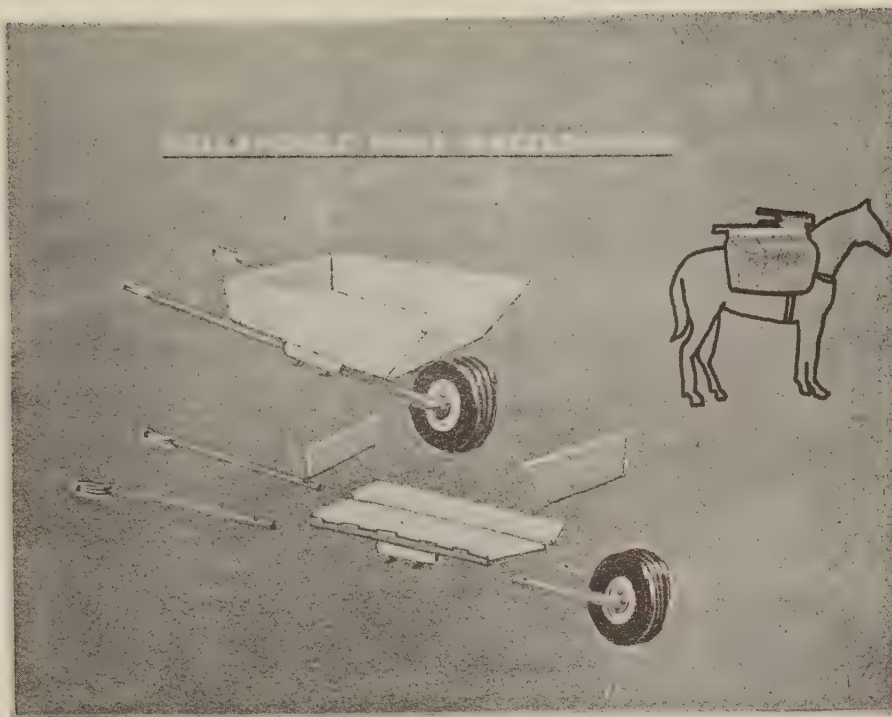


Figure 17.--Horse packable wheelbarrow.

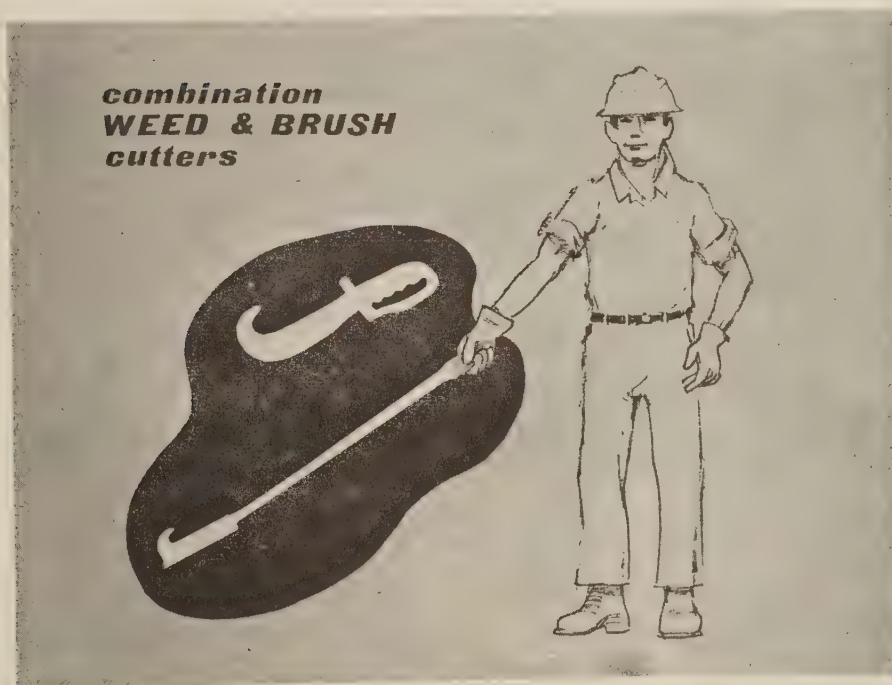


Figure 18.--An example of brushing tools.

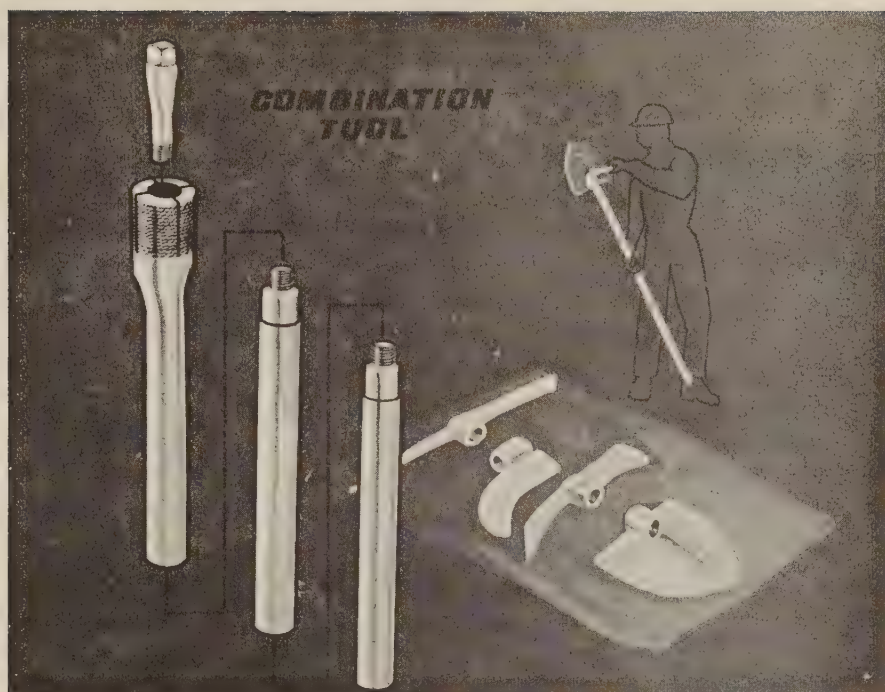


Figure 19. Combination tool.

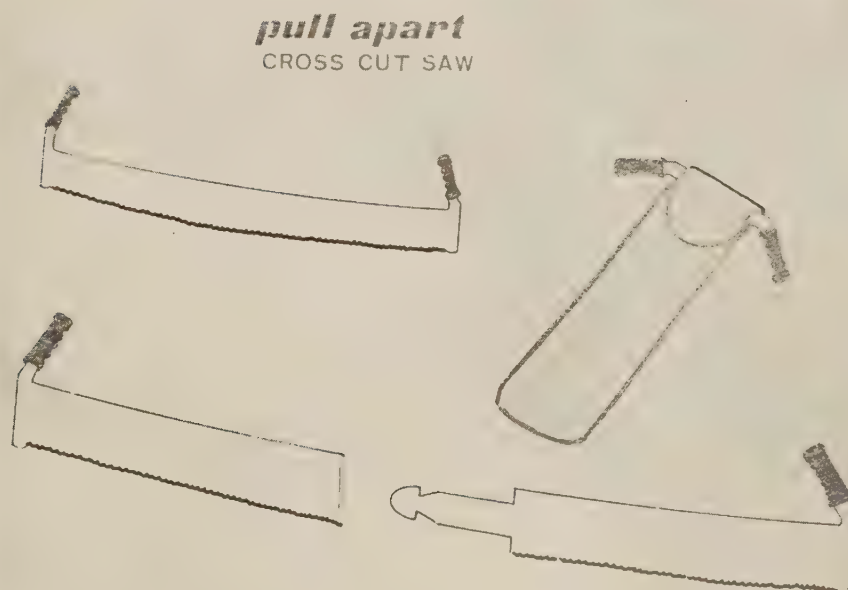


Figure 20.--Pull apart crosscut saw.

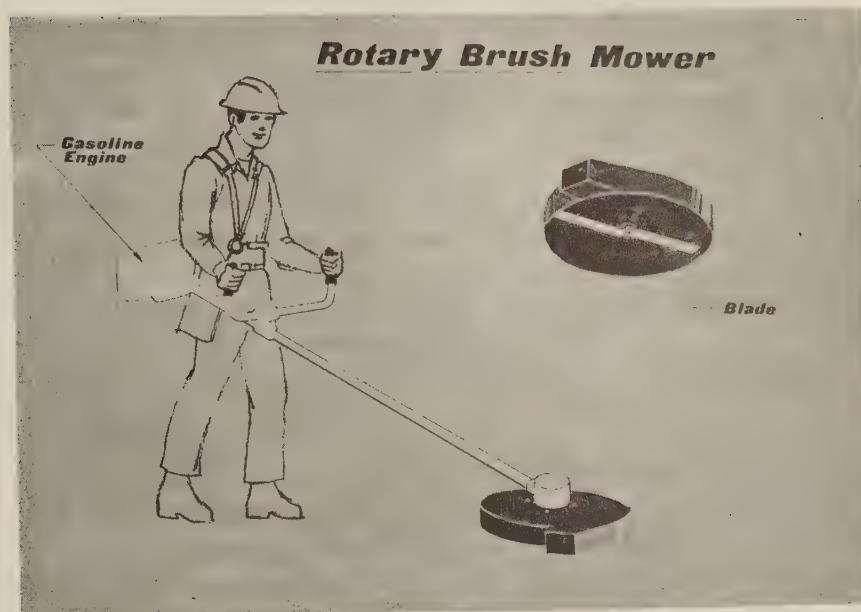


Figure 21.--Rotary brush mower.

2. Problem: Camping Equipment and Food

a. Statement

District people know very little about what is available in contemporary camping equipment or are reluctant to commit precious funds for experimentation. Much of the camp equipment used today is antiquated and often worn out. The weight and bulk of present camps create unnecessary logistical problems. From six to nine pack animals are required to transport the food and equipment used by a three man trail crew for 10 days. Many camp items considered necessary for comfortable living are lacking on many Districts and therefore provided by members of the crew.

b. Discussion

When a comfortable camp is lacking, work time is spent making campsite improvements. Poor equipment reduces morale and leads to lower productivity. The standard Forest Service wall tent is usually the only one available for use by trail crews. Most crews find it heavy, difficult and time consuming to erect. For the most part, they will only put it up under threatening rain or cold weather conditions. This type wall tent requires that native poles be obtained at the campsite. Many Districts have a desire for better tents but lack any good evaluation of the factors to consider in selecting tents. People are concerned with how well new designs will function for trail crew needs. Cold mornings are common in the high country throughout the season, and both early and late in the season at lower elevations. The inability to warm up at the beginning of the workday reduces the desire to get started.

Trail work at midseason is hot and dusty but provisions are rarely made for showering.

The type of camping equipment available on Districts today creates more problems for maintenance crews than for construction crews. When a considerable amount of work is done over a relatively short section of trail, a semipermanent or "hard camp" can be set up. Existing equipment lends itself more to this type of use than the situation where camps are moved repeatedly. Recent introductions of new camping equipment on the commercial market, manufactured to meet the needs of outdoor recreationists, have made many trail camp techniques obsolete. The Forest Service is gradually falling behind the state-of-the-art in camp equipment and failing to modernize trail support operations by not updating this equipment.

Traditional foods such as canned goods are used by almost all crews. Fresh meats and vegetables spoil rapidly in some cases and often do not last beyond the third day. Therefore, canned foods are relied upon quite extensively. Most crews are paid per diem and there is little or nothing that Districts do or can do to influence food selection. Many Rangers are concerned that young crewmembers cannot select and cook food to obtain a balanced diet. In other cases Districts are relieved of additional responsibility by paying per diem. Crewmembers in turn will often skimp on food and save money, but poor diets lead to reduced productivity.

Many Districts are interested in new food processing techniques but lack knowledge and exposure to many of these products. There have also been some bad experiences associated with freeze-dried foods that date to the early history of the freeze-dry industry. It is generally believed that a crew could not be sustained for 10 days on dehydrated foods.

Some Rangers believe it is more efficient to pack in liquid fuels than to gather firewood. The more experienced packers prefer wood burning stoves. The sheepherder's stove, made of 20-gage iron, is very popular and the Kimmel stove, also of 20-gage iron, is used to a lesser extent. The sheepherder's stove is not durable and the Kimmel is big, heavy (up to 100 pounds), and requires that the fire be built on the ground.

Two liquid fuels, gasoline and propane, are becoming increasingly popular for fueling appliances. Problems with these fuels arise during transportation by pack animal. Gasoline is difficult to contain and leaks are common; propane tanks are heavy and cylindrical in shape, thus making them difficult to pack.

Once camp is set up, after a full day's work on the trail, there are few inducements to prepare a wholesome meal. Most Districts have attempted to design a horse packable "kitchen" box which centralizes all utensils used in meal preparation but none actually serve the purpose fully. Commercially made kitchen boxes or plans for box construction are not available except on a very local scale.

c. Ideas from the Field

- (1) Kitchen boxes.
- (2) Collapsible shower pail.
- (3) Provide portable refrigerators.
- (4) Use pack boxes for camp furniture (see fig. 22).
- (5) Use square cooking equipment.
- (6) Provide meal plans and nutritional guidelines.
- (7) Provide a specialized shelter (see fig. 23).

MODULAR HORSE-PACK
adaptable for camp use

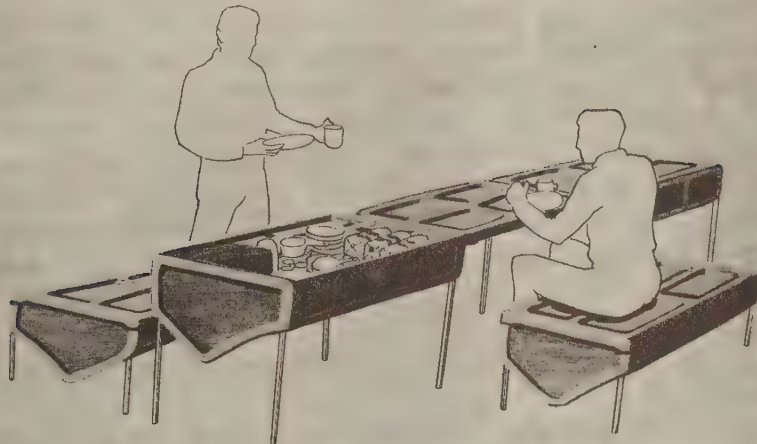


Figure 22.--Pack boxes used in camp.

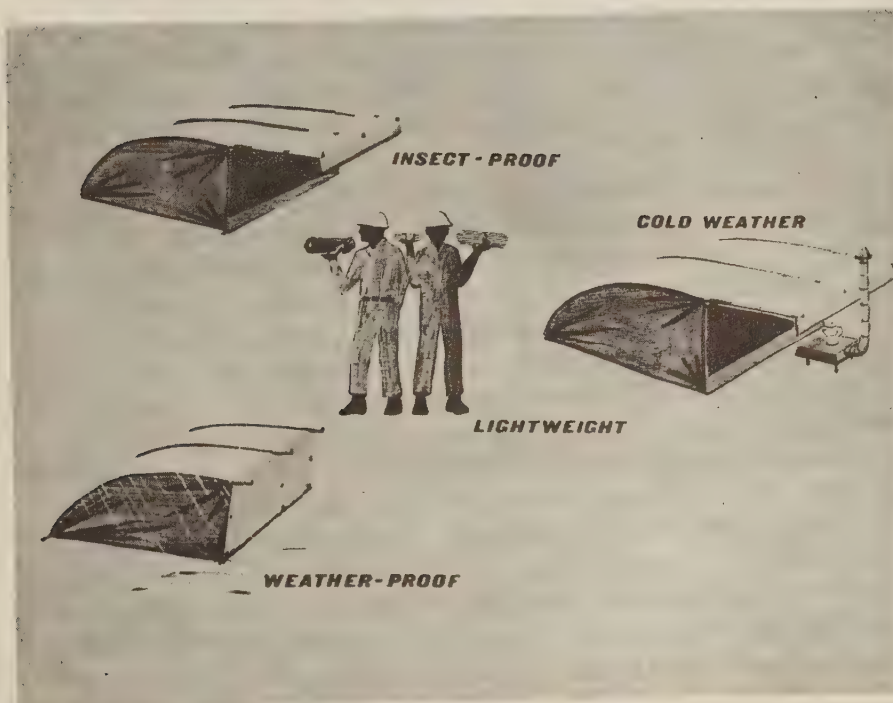


Figure 23.--A specialized shelter.

3. Problem: Pack Saddlery

a. Statement

Conventional packsaddles (Decker and Sawbuck) require skill in their use which can only come through years of experience. A person must dedicate a portion of his life to the study of the art of packing. This art is not being perpetuated as it once was; consequently, the use of these types of pack-saddles causes the Forest Service to be dependent on a specialist who is gradually disappearing. Improvements in existing saddle designs or materials, with minor exceptions, would not be significant.

b. Discussion

Packing is an old art and has not changed significantly since the early 1900's. Forest Service practices are well within the state-of-the-art. If change is deemed necessary, the Forest Service would be leading the way. Change may be desirable from the standpoint of work simplification (reducing the skill level and maintenance tasks), convenience (multiple use packing containers), and impact reduction on heavily used trails and campsites (reducing the total number stock needed). The tasks of saddling, preparing loads, attaching and balancing loads, equipment maintenance, etc., all require working with canvas, leather, and rope. People who are unfamiliar with animal packing tend to believe it is a very inefficient operation.

With conventional techniques there is always concern for ropes slipping and loads shifting. The packer usually has to make adjustments by himself while on the trail. Steep grades, stop and go travel, his lifting limit or ability to lash loads, and poorly fitting saddles lead to a reluctance to load an animal to its capability. In addition, the packer is typically relied upon to manage stock, shoe stock, pack, supervise work crews, select campsites, make camp, cook, etc. He is expected to work long hours for 8 hours of pay and receives few tangible rewards. To compete in the Forest Service career ladder he typically moves to other positions upon gaining several years' experience as packer. Districts expressed concern in filling packer vacancies. Retaining packer positions is sometimes difficult and resource assistants are sometimes required to pack as a part of their job.

There is a multitude of small significant items that are required for the smooth operation of a trail crew. Keeping track of this equipment is a constant concern since most packs have to be opened and repacked every day. There have been attempts to build specialized pack boxes to centralize items and reduce packing time. Most were built with limited design knowledge on a local basis because none are commercially available.

c. Ideas from the Field

- (1) Contemporary pack system (see fig. 24).
- (2) Provide better sign packaging.
- (3) Provide guidelines on padding.
- (4) Develop plans for pack boxes.
- (5) Cardboard pack boxes.
- (6) Extra wide cinch (see fig. 25).

concept
MODULAR HORSE-PACK



Figure 24.--Modular animal packing concept.

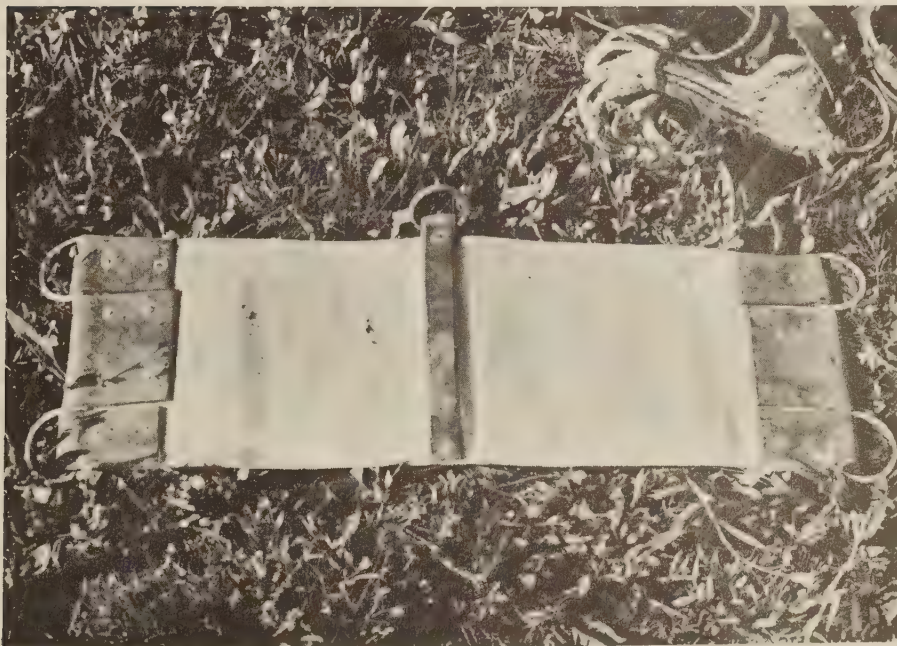


Figure 25.--Extra wide cinch.

4. Problem: Backpacking

a. Statement

Without stock to transport trail crew support equipment in remote country, man-carried pack equipment has to be used. Few of the present backpacking devices found on most Districts lend themselves to carrying large loads over extended distances. Generally, District people have been unable to keep abreast of the latest developments in contemporary backpacking equipment. They are unsure of its durability and reluctant to commit precious funds for experimentation.

b. Discussion

Some Districts have purchased lightweight pack frames and pack bags from those available commercially. Not all have held up under the hard use received from Forest Service crews; however, most of this equipment has been produced for the recreation market. Most personnel feel there have been improvements made in backpacking equipment in recent years. They feel, from an equipment standpoint, there is a greater potential for backpack trail maintenance than ever before.

c. Ideas from the Field

(1) Evaluate backpack equipment.

5. Problem: Grazing Stock

a. Statement

When traveling with stock, campsites cannot be randomly located; horse feed and water must be accessible. The control of stock in a camp area is a constant concern when corrals are not available, when the packer is not experienced, or when water and graze are lacking. Natural phenomenon can compound the problem.

b. Discussion

An effective method of packing water does not appear to have been perfected. Water for camp use often takes priority and horse feed is not always available at the best sites. Camping in arid regions and high mountain terrain can require packing in horse feed and water. In heavily used wilderness campsites, horse feed is not readily available because of overgrazing, and recreational use is given priority.

When stock wander off, many hours may be required to retrieve them. Horses can be highly unpredictable and are of more concern than mules. Current techniques such as hobbling both front feet are not always reliable and can be injurious to stock.

If the horses are not allowed to graze, it is difficult to carry enough feed for extended stays. Many packers carry oats or pellets to facilitate catching and holding stock in a camp area.

c. Ideas from the Field

(1) Portable electric fence.

6. Problem: Shoeing

a. Statement

Horseshoeing is a specialized job that is often considered to be very disagreeable.

b. Discussion

Often horses or mules have to be reshod when competent farriers are not available. Current methods require a degree of skill which only comes with experience. Shoeing can be hazardous to the beginner and therefore leads many to view it as a very disagreeable job. But shoeing capabilities are fundamental to the use of stock away from the station since a shoe can be lost at any time. With normal use, stock are commonly reshod every 6 weeks or about three times during the summer. Mule shoes are becoming difficult to find on the commercial market and the quality of both horse and mule's shoes appears to vary with different suppliers.

c. Ideas from the Field

- (1) "Hard-faced" shoes to extend life (see fig. 26).
- (2) Plastic slip on shoes (see fig. 27).



Figure 26.--Hard-faced shoes.



Figure 27.--Plastic horseshoes.

7. Problem: Explosives

a. Statement

In the field of explosives, Forest Service techniques are often felt to be inferior to the present state-of-the-art. Encroaching Federal regulations are discouraging use on a force account basis. Most trails people want to know more about the latest developments, particularly shaped charges.

b. Discussion

When breaking rock with explosives, a capable drill operator is essential. If experienced labor is not available, the cost of drilling can exceed the cost of using an excessive amount of explosive. Rock drills are quite reliable but a failure can create a long work delay in remote areas while the drill is brought out for repair.

The number of holes required for some maintenance trips does not justify packing a drill. A rapid moving crew with an objective in mind of just getting through will do very little, if any, rock drilling. In some cases, rock drilling in wildernesses is deferred to periods when recreation use is down. Rock drills are very seldom used in Region 3 wilderness areas due to strict restrictions on motorized equipment.

In desert areas mud is not readily available for mud capping.

Forest Service blasters may not be nearly as out of date as they believe. The problem may lie in the area of self reliance or current information so that a blaster can be assured that he is not using obsolete practices.

c. Ideas from the Field

- (1) Develop an explosive to build water dips.
- (2) Develop a technique to remove downfall with explosives.

8. Problem: Stock Quality

a. Statement

The degree of success in horse and mule dependent operations is keyed to the quality of stock used. The Forest Service has not always been willing to seek out good quality pack and saddle animals. Well trained and well mannered pack or saddle stock is expensive.

b. Discussion

Some Forest Service employees such as engineers and contract inspectors who are not competent horsemen are sometimes forced to use horses in their work. Competence in horsemanship comes only with much experience and a certain desire to get along with animals. The average trail crewmember knows little about packing and safe movement around pack animals. On a few Districts the packer is required to go along whenever pack stock is used. Higher levels of administration are often not receptive to formal training programs involving basic safety in stock handling.

c. Ideas from the Field

- (1) Locate good sources of supply.
- (2) Training on horsemanship.

9. Problem: Personnel

a. Statement

Trail work assignments are often delegated to inexperienced personnel as a low priority task. It is a constant concern of managers to find personnel who have a sincere desire to live in the back country for extended periods. Some crews are assigned to trail work between assignments on fire. These crews view this as a "make work" situation. Crews need to be experienced in order to make on-the-ground decisions when reconnaissance data or maintenance plans are lacking. But crews are seldom prepared through formal programs to do trail maintenance work.

b. Discussion

Engineers often question the quality of force account maintenance conducted at the District level. The alternative as seen by them is contract maintenance or centralized forest crews. Writing trail maintenance contracts is difficult because most clauses have to be subjective in nature. There are also many unforeseen situations which occur and cannot be written into the job. In addition, contract administration requires mature judgment and a greater proportion of time because of the remote worksites.

Good quality condition surveys are usually lacking. Detailed condition surveys containing quantitative data for good decision making are expensive.

When trail work is completed by contract, the need for the Forest Service to provide equipment and a working force is passed to the contractor. Those in favor of contracting usually feel that most problems expressed in this report can be solved easily by contractors.

c. Ideas from the Field

- (1) Centralize maintenance at the Forest level.
- (2) Contract all trail maintenance work.
- (3) Develop an engineering approach to condition surveys.

10. Problem: Trail Financing

a. Statement

Everyone interviewed stated that it is impossible to do what needs to be done with existing funds. There is a basic conflict about how these limited funds should be used. Wilderness restrictions and inflation have increased maintenance costs over the last several years. Most Districts feel that adequate funds do not exist to maintain the trail system using present methods.

b. Discussion

Many managers expressed concern for the deterioration of the trail system because needed maintenance is not performed. Some have a sincere desire to open and make passable as many miles of trail as possible. Others would use the funds to protect investments in good trails. They also feel an obligation to provide employment for their trail crewmen for as long as the season allows. These factors make it difficult for managers to justify the purchase of new trail equipment and dictates that work be estimated on the basis of what can be afforded rather than what is really needed.

The expressed goals of trail maintenance become very idealistic when viewed in the light of current conditions. Alignment, trail marking, and tread width may not be adequate for public safety. Many substandard trails will serve the needs of experienced packers, but with increasing recreational use these trails present a safety hazard to public travel. These old deteriorated substandard trails have existed for many years and have, as of now, an undetermined value. The application of hand operations with pack animal support cannot be adequately assessed under deteriorated trail conditions because these conditions would cause any method to appear costly. There is very little trail construction work being funded which would update (or minimize maintenance costs) or replace the present trail system.

c. Ideas from the Field

None.

11. Problem: Wilderness Policy

a. Statement

Changing wilderness management policy has led to confusion on the ground in completing trail tasks. District people are concerned that they have not received enough written guidelines.

b. Discussion

None.

c. Ideas from the Field

(1) Provide guidance on wilderness trail management.

12. Problem: Change from old Methods

a. Statement

It is difficult for some trail foremen or fire control officers in charge of trail maintenance to visualize change or improvements.

b. Discussion

Often these people are tradition oriented or are continually "too close to the problem." This makes it difficult for them to see potential innovations.

c. Ideas from the Field

None.

IV. DISCUSSION

The study was concerned only with the needs of engineering trail crews. However, some of these needs, particularly lightweight backpacking equipment, may relate quite strongly to those of other engineering crews, recreation managers, and timber and range survey crews at both Forest and District levels.

A District's involvement in trail activities was usually dependent upon its total trail mileage and the amount within Wilderness or Primitive Area classification. It is within wildernesses that heavy reliance is still placed on horse and man packing methods for getting the job done.

Some of the comments related to restrictions placed on the use of motorized maintenance equipment in wilderness. Equipment development efforts which work toward meeting these restrictions will benefit much of the remaining National Forest trail system due to the substandard trail conditions that presently exist. Unless large scale funding is provided for reconstructing the many miles of inadequate trails, horse packing or man packing methods of trail maintenance will continue to be used. Handtools or horse packable power tools will continue to be needed.

The methods and equipment developed by Districts over many years of coping with the trail work tasks were surprisingly uniform from Region to Region. There were fewer variables involved than was suspected at the beginning. Some Districts had been more successful than others in adapting equipment to their needs. But in almost all cases District people would welcome assistance in keeping abreast of new developments in all items related to trail work. Many just do not have the time nor the expertise to locate potential equipment.

V. CONCLUSIONS

- A. 1. Handtools are relied upon almost exclusively for trail work. Few have been designed specifically for trail requirements and most have been borrowed from other industries. Handtools will continue to play a major role in trail work because of wilderness restrictions, trail conditions, remote work sites, and their simplicity.
2. Chain saws and gasoline powered rock drills are used very effectively on trails, but other powered handtools have not been used extensively.
3. Few improvements have been made on horse drawn equipment in recent years. Operators and animals are being trained only in isolated cases and trail managers find it quite difficult to obtain qualified men and equipment to accomplish work on a broad scale. From a maintenance standpoint, horse drawn equipment, outside of trail grading, has only limited application. If trail construction is to be programmed on a large scale in wilderness areas, the demand for horse drawn equipment could increase proportionately.
4. The type of camp equipment, tools, and food used today necessitates animal transport. Backpack maintenance will not replace horse packing until the weight and bulk of these items are reduced. The weight of the tools becomes the limiting factor when backpacking; extremely lightweight camping equipment and food are available.
5. Packers are important to most trail operations today, but they are gradually disappearing from the ranks of Forest Service personnel. To offset the loss of skilled packers, a simplification of packing techniques is necessary. A system that does away with all ropes, lash cinches, complex hitches (such as the diamond, squaw, sling and barrel) and cargo covers will reduce to a minimum, if not entirely, the necessity for employment of the experienced and skilled packer. Experience in handling stock and well trained gentle animals cannot be replaced.
6. Recent changes in regulations, along with administrative concern, suggest that new uses for explosives will be deferred.
7. Economic measures have not been developed which can be used to determine a trail's value. Consequently, the amount of maintenance cannot be realistically planned, trails are not being programmed for reconstruction, and equipment development costs and benefits cannot be projected intelligently.

8. Trails are of low priority in National Forest programs, except where large wilderness workloads exist.
9. There is a trend toward doing trail work by contract in Regions 3 and 6; and the burden for solving equipment needs is being transferred to the contractor.
10. Improvements in camping equipment, foods, and packing systems would benefit wilderness programs, contractors, and the commercial packing industry as well as engineering trail crews.

VI. RECOMMENDATIONS

- A. 1. A thorough investigation of potential handtools for specialized trail tasks is needed along with the dissemination of technical information showing a family of applicable tools. Sources of supply, servicing needs and operating tips should be included. The feasibility of significantly improving these handtools should be determined and reported on.
2. Powered handtools for brushing, repairing tread, and creating drainage patterns which are animal packable should be developed for evaluation. Time should be allowed for creative thinking and concept generation. The objective of this development would be to replace handtools with powered handtools where applicable to enhance economy in trail maintenance.
3. Support should be given to the Los Padres National Forest in their effort to perfect a horse drawn trail grader. The final design should then be tested on a Service-wide basis. With the exception of this grader, little emphasis should be given to horse drawn methods at the present time.
4. Military and contemporary outdoor recreation equipment should be integrated into trail crew support equipment. A program should be implemented to provide the field with evaluations of modern camp equipment and food.
5. A simplified contemporary animal packing system should be taken through the prototype stage of development for evaluation. If unsuccessful, specialized pack containers should be designed for conventional saddles.
6. Several backpack trail maintenance crews should be organized and evaluated over one or more seasons.
7. New methods of controlling stock while grazing outside of permanently fenced areas should be investigated.
8. Commercially available plastic horseshoes should be evaluated and reported upon.
9. The findings concerning explosives should be considered in ED&T 2187 - Explosives for Roads and Trail Work.
10. Special consideration should be given to gaining the support of field personnel when innovations are released to the field.
11. Administrative consideration should be given to the production of a professional quality slide-tape training program on trail maintenance.

12. Alternative solutions to the 12 problems should be thought out by the ad hoc committee, the Washington Office, MEDC, and several trail coordinators. The solutions should then be displayed and thought through in terms of trail management objectives and costs by the Division of Engineering in Washington.
13. Development projects should not be initiated without some assurance that the field can afford to implement the results.

APPENDIX A

INTERVIEW QUESTIONS

1. How many miles of trail do you maintain?
2. How many of these miles are closed to motorized travel, such as under Wilderness or Primitive Area classification?
3. How many personnel, on a seasonal basis, are hired as full-time trail maintenance crewmen?
4. What is the average size of your trail maintenance crews?
5. Do you hire a full-time packer? Seasonal? Year-round?
6. How many horses and mules are maintained on the District during the summer season?
7. How many of these are District owned?
8. How many rented?
9. What type of packsaddles do you use? How many?
10. How is an average load usually slung from the packsaddle?
11. Do you have any pack boxes that are used regularly? Describe these boxes and the way in which they are used; i.e., the equipment that is carried within, etc.
12. Are you satisfied with the method you are now using to carry the trail maintenance equipment on the packsaddle?

What is a better way?
13. What kind of supplemental horse feed is carried per pack or saddle animal during overnight trips away from administrative cabins?

How much for each animal per day?
14. When animals are allowed to graze in the vicinity of a trail maintenance camp, how are their movements controlled?
15. Generally, is your trail maintenance crew(s) required to spend their workweek away from administrative cabins?

16. Describe the other types of shelter used.

Which is preferred by the crew?

17. Do they operate on a 10 and 4 or 5 and 2 work schedule?

18. Are they resupplied by pack animal?

19. Does a packer and pack string stay with the trail maintenance crew during the entire time?

How many saddle horses and mules are used?

20. Generally speaking, how often does the trail crew have to change the location of their camp?

21. Describe how this is done and what criteria is used in deciding when to move.

22. Are you satisfied with the above methods of operation?

23. Does your trail maintenance crew(s) receive per diem or subsistence while away from their duty station?

24. What handtools are generally carried with the trail maintenance crew? (Include chain saw and rock drill, etc., if applicable.)

25. Which of these tools are employed most often?

26. Are you satisfied with these tools?

What changes would you make?

27. On a season-long basis, indicate the percent of total worktime generally spent doing the following tasks:

- a. Logging out.
- b. Removing loose rock.
- c. Brushing out.
- d. Tread repair.
- e. Drainage.
- f. Corduroy repair.
- g. Bridge maintenance.

- h. Pack clearance.
 - i. Signs.
 - j. Blazes or markers.
28. List the camp equipment carried by one of your trail maintenance crews.
29. Generally, what kind of food does the trail crew carry with them?
Has this been a change from, say, 5 years ago?
30. What camp equipment items does your District have which are specially designed for backpacking?
31. How many aluminum backpack frames does your District own?
32. Does your District have a serviceable horse drawn trail grader?
Trail plow? When was each last used?
33. Does your District have any serviceable harness equipment for horses and mules?

APPENDIX B

PERSONS INTERVIEWED

- | | | |
|-----|----------|--|
| 1 | Feb. 8 | Bill Holman, Ranger, Moose Creek District, Nezperce National Forest, R-1 |
| 2 | Mar. 1 | John Christenson, packer; Charles Harrington, packer, Nine Mile District, Lolo NF, R-1 |
| 3* | Mar. 4 | Rick Hockley, Forest Engineer; Bud Hamilton, FCO, Challis District, Challis NF, R-4 |
| 4* | Mar. 8 | Jim Coil, Ranger; Dean Lundberg, FCO, Magruder District, Bitterroot NF, R-1 |
| 5** | Mar. 12 | Dale Dufour, Forester; Cal Tassinari, Wilderness Ranger; Herb Styler, FCO; Flip Darling, SO Staff; Don Bennett, FCO, Condon District, Flathead NF, R-1 |
| 6* | Apr. 27 | Tom Kovalicky, Ranger, Stanley District, Challis NF, R-4 |
| 7* | June 7 | Will Griffin, Ranger, Santa Maria District, Los Padres NF; Walt Svetich, Trails Technician, Los Padres NF, R-5 |
| 8 | June 11 | Phil Russell, Division of Engineering, RO, R-5 |
| 9 | July 7-8 | Lewis Campbell, Ranger; Drew Bellon, Forester, Rock Springs District, Bridger NF, R-4 |
| 10* | July 12 | Earl Dodds, Ranger; Jack Rigby, FCO, Big Creek District, Payette NF, R-4 |
| 11 | July 13 | Shorty Derrick, Packer, Mule Skinner, Trails Foreman, etc., at Chamberlain Basin Station, Big Creek District, Payette NF, R-4 |
| 12* | July 14 | Bill Parks, Ranger; George Griffin, FCO, New Meadows District, Payette NF, R-4 |
| 13 | July 15 | Henry Shank, Ranger; Al Stillman, FCO, McCall District, Payette NF, R-4 |

* Interview tape recorded and transcribed.

** Interview tape recorded but not transcribed.

PERSONS INTERVIEWED (con.)

- 14* July 19 Howard Barstow, FCO; Dennis McMillin, Resource Assistant; Ben Englebright, Wilderness Ranger, Darrington District; Robert Dewity, Recreation & Lands, Mt. Baker NF; Lee Corbin, Regional Trails Coordinator, R-6
- 15* July 17 Fred Arnolt, Assistant Forest Engineer, Tonto NF; Paul Weaver, Regional Trails Coordinator, R-3
- 16 July 18 Navarez Gutierrez, GDA, Sandia District, Cibola NF, R-3

PLACES OBSERVED

- 1 June 8-10 Walt Svetich, Trails Technician, RO; Scotty Beaten, Packer; 4 trail crewmen, San Rafael Wilderness Trail Camp, Los Padres NF, R-5
- 2 July 7-8 Doug Haws, Ranger, Afton District; Lewis Campbell, Ranger, Rock Springs District; Drew Bellon, Forester, Rock Springs District; 7 wilderness rangers at Wilderness Training School, Pinedale, Wyoming, Bridger NF, R-4
- 3 July 20-21 Howard Barstow, FCO; 2 packers and 3 trail crewmen, Glacier Peaks Wilderness, Darrington District, Mt. Baker NF, R-6
- 4 July 27-30 Wayne Campbell, Trail Foreman; Don Gossi, Packer; Mike Booth, Crewman; Trail crew for Challis District, Challis NF, R-4

APPENDIX C

PERTINENT EXCERPTS FROM INTERVIEWS (SYMPTOMS OF PROBLEMS)

I. TASKS

Region 1, Bitterroot NF, Magruder RD

1. All you have is crosscut, axe, pulaski, grub hoe, crowbar, brush hook, shovel, maybe a chain saw and that still takes a mule.
2. We're having trouble finding a guy to sharpen crosscut saws.
3. We don't even ask our crews to sharpen them (crosscut). We don't even want them to touch it.
4. I have never seen a FS manual on saw sharpening.
5. If it doesn't get a lot of use it will get brushed down and our trails don't get a lot of use.
6. We need something you can roll up all this old telephone line with.

Region 3, Tonto NF, Div. of Engineering

1. 75% just grew and weren't constructed.
2. Some of the trails have been washed out to nothing but rock.
3. Some trails are so badly grown over you can't even find them.
4. It takes a lot of mature inspection to go out and get your money's worth.
5. You can't compact the earth because there isn't any moisture in it.
6. To cowpuncher-Rangers, if they can get through it is fine. It doesn't matter the grade or the boulders.
7. The tread is gone, it washed away.
8. It takes 2 hours to build a drainage dip, we might stake say 20 of these per mile.
9. Our biggest problem is the effective use of explosives.
10. Mud for mud capping is pretty hard to find around here.

11. You can't measure it so you go out there and instruct.
12. There is all different kinds of situations that came up, it's not fair to leave the contractor alone too long.
13. Anything that could be used legally to retard growth would be a help, you just cannot imagine how fast that brush grows.
14. We haven't solved that trail marking problem.

Region 4, Bridger NF, Jim Bridger RD

1. We can't find anybody to set and sharpen crosscuts so actually we have quite a collection of them. But nobody knows how to set and sharpen them. So then we went to the bow saw.
2. On a wilderness District I would like to see that art kept alive (crosscut).
3. We never had any problems ordering new crosscuts. It's just when they got dull we didn't know what to do with them.
4. Under the Multiple Use Standard for the Bridger Wilderness no brush can be cleared. We carry long-handled snippers to cut overhead hazards.
5. Never had a use for a trail grader.
6. We tried mostly to wait until fall to use the rock drill, we didn't want to use it during the height of the recreation season.

Region 4, Challis NF, Challis RD

1. Cutting timber is our biggest job.
2. We have quite a bit of earth work we are not getting done.
3. Everytime we use the grader we have to unpack it.
4. Guys to sharpen crosscuts are just disappearing.
5. It's harder to find people to run the crosscut than it is to get it sharpened. Whether they can or not is not the problem--they just won't.
6. There is such a thing as running a crosscut right or wrong.
7. In the field of explosives we are reaching out trying to find what is available.

8. Shape charges are a lot lighter than a rock drill.
9. Clearing brush is a slow task--awfully slow. It is monotonous.
10. We know that we just get over the trail with a string but we consider it passable. Lots of people without horse experience might say it wasn't.
11. We can go into a place that has been washed out real bad--it might take a whole day to fix it right, but we only have time to fix it so we can get over it.
12. We used to grade it once a year. This year with the impact it has had we are going to have to do it 2 or 3 times a year.
13. Relocation is usually a small job--less than 10 days, not over 20.
14. One problem is recognizing what needs to be done.
15. Handtools is a place where we could stand some improvement.
16. We need a good solid design on the horse grader.
17. If you could get it so a guy wouldn't have to stoop over when cutting brush.
18. When you cut brush with a nipper it takes forever.
19. With a chain saw you can snip off a tree in maybe 15 minutes, where it would take a guy a half a day with a crosscut saw.
20. We especially cut brush on high priority trails because they tend to be in better shape and we try to keep it that way.
21. If we do less maintenance the trails will soon become impassable.
22. I figure there is 2 days out of 10 we work on picking up litter.
23. Weather, not use, causes our maintenance problems.
24. We need a device for winding telephone wire.

Region 4, Payette NF, New Meadows RD

1. One day they will work with the saw and cut out a trail. The days they work with a saw they will go farther. If there is dirt work or rock work they don't go as far.
2. We always open trail first so we can travel on them with a pack string.
3. I think there could be some improvement in packing a chain saw-- both human and mule.
4. If you use a Cobra right it is an effective tool, but if you don't you might as well bulldoze it up (with more powder). The cost of labor is much more than the cost of powder.
5. In the pine country you can't hardly saw with a crosscut. You have to take the toe of the pulaski and scrape the pitch off.
6. We try to get a new chain saw because we don't want them to break down.
7. They carry a fire pack with them all the time.
8. Some fellows can work himself to death with a pick if he doesn't follow the seams.
9. We have to have a guy who knows how to handle the mule grader.

Region 4, Payette NF, Big Creek RD

1. We are in the process of trying to get those damn signs up out there.
2. Conditions of the trail vary tremendously.
3. You cut the mountain--a few weeks later you get a windstorm and they are back again.
4. We have a terrible time in getting started early because of snow.
5. We haven't had very good luck at all with Swede saws.
6. You have to know what you are doing with a crosscut saw when you sharpen it.
7. We have a big rock problem on the south side.
8. It's hard to find somebody to be able to run the trail grader.
9. One objection to the trail grader was that it was cutting off a lot of fine material.

10. Most of the man-hours on the south side is spent on rock work. I mean rocks in the trail and sliding and sluffs in the trail and cribbing retaining walls on the cut and cribbing on the fill.
11. Of course on the high country we have some log cutting too.
12. So we do quite a bit of water bar installation.
13. Cribbing is one of our problems because a certain amount go out every year and we have to rebuild them.
14. I can't think of any improvements of anything you could use then that would take the place of shovels and picks.
15. Every year just about, it means 1 day's work there.
16. Our mileage might be too great that we are trying to cover every year for one thing.
17. When I say maintenance job I mean everything not just cutting logs and getting it passable.

Region 5, Los Padres NF, Santa Maria RD

1. During the summertime much of our country is hot--water is not accessible. The ground is hard and it doesn't lend itself to working on the trail.
2. Here trail work is in the winter and in the spring.
3. It has built up a situation that makes people think that it is just a "make-work" project for fire people.
4. Widening the tread primarily to where it's safe--public safety is the primary thing.
5. Where the country gets steep we don't think the trail handbook is sufficient enough.
6. We use the chain saw for brushing whenever possible or for safety reasons we go to the pole saw or another handsaw.
7. We are in the maintenance and realignment state of many of our trails. We are not satisfied with the original alignment.
8. Roughly about 1/3 of our miles on record are in wilderness.
9. About 75-80% of our time is in the wilderness.

10. Our recent efforts have been to repair flood-damaged trails which occurred 3 years ago.
11. We get encroachment with brush but only get an occasional tree down across certain trails.
12. Sluffing is an annual thing to certain degrees. It depends on the rainfall in the winter. Two or 3 years ago we had a tremendous rain and had a lot of slips.
13. People who are unfamiliar with animals--they are fighting this animal and don't know how to handle him. They don't know how to keep him in the plow line. Pretty quick the animal is down the hill and the plow is up here and you have scarred the whole hillside and the guy has nothing done. He will say "Boy, you guys are really primitive. It is easier to do it by hand."

Region 6, Mt. Baker NF, Darrington RD

1. The first thing they do is buck everything out up to the snowline.
2. The problem is that today's man is not a crosscut man. It takes training on the job. It takes years of experience so they just wear their way through logs.
3. I tried to buy some new saws this year and I can't get a regular bucking saw.
4. The time of logging out has increased easily by 2/3 or 75% since we had to use crosscut.
5. Three men worked on 1 log for 9 man-days to get through the damn thing. It was 72" thick. It had to have four cuts on it.
6. Logging out is a never-ending chore.
7. Logging out isn't trail maintenance.
8. We can use powder to log out but when you get done you have one hell of a mess.
9. We're getting out of the powder business. If we've got any big job to do we've been told to contract it.
10. We tried getting about everything that is available and also we make some brush tools. This might really be something you could work on.

11. The old Sandvig brush axe is kind of like eating soup with a fork.
12. We have to brush at least once a year. Another thing we need and can't use is a sterilant of some kind.
13. Each of these different types of brushing tools only get part of the job done.
14. We brush right to the top.
15. We just can't make any time at all moving out sluff and knocking off the burn when we have to do it by hand.
16. A tall person can't perform well with the same length handle that a short man uses.

II. CAMP

Region 1, Bitterroot NF, Magruder RD

1. We designed our own grub boxes. You can't get around without them. You really need a pair. We couldn't buy a box like that, no one is making them.
2. He won't always put up a tent. We use the 10x12 wall tent.
3. They don't pack a tent too often, they usually use a fly. Early and late they take the tent.
4. The more of these wall tents you put up the more opportunity you have for logging off the wilderness too.
5. It costs me something for them to build a fire if they have to build a fire to fix their evening meal.
6. A lot of times the Coleman is awful hard to put 2 frying pans on.
7. If you left it up to Harold, he wouldn't even have a stove. He would just eat out of a can. He probably eats the meat raw, too. He doesn't like to spend a lot of time cooking.
8. Some of the inexperienced kids would starve to death if it was up to them. They're just not akin to cooking at all.
9. We seem to get fewer and fewer people that are interested that have a background in outdoor cooking.
10. Most of our trail crews use canned goods. Fresh meat and vegetables last only a few days or so.
11. We bought a lot of dehydrated stuff last year from Stol-Way and they weren't satisfied with it.
12. I would hate to see us go strictly to dehydrated foods for a whole 10 days.
13. Some of the kids would take a case of peanut butter and not much else.
14. Sometimes they lose the ability or opportunity for a balanced diet.
15. They work hard all day and they don't have a hell of a lot of time left to fool around with an elaborate meal. We haven't done a thing on this really, we are doing it just like we did 30 years ago.

Region 3, Tonto NF, Div. of Engineering

1. He is forced to set camp where he can water his stock.
2. Nylon, to be waterproof, has to be treated. If it isn't treated it doesn't breathe, if it doesn't breathe it sweats.
3. The average man that you have today is not used to living the way they did 30 years ago, and you can't send him back there with no equipment or something "good enough for grandpa." You'll never get any work out of him.
4. There is a lot of this camp equipment stuff that could be improved upon.
5. Some of these guys will go back there and waste 4 hours trying to put up a bear-chewed, heavy canvas wall tent.
6. They make a lot of nice stuff today but it needs to be tested for durability.
7. It takes a couple of days for the contractor to pack in his central camp.
8. If wood is available they have one man gather wood for them.
9. District personnel spend half of their time making themselves comfortable rather than working.
10. Some of the freeze-dried foods are good and some aren't.
11. It's tough to find enough water to wash dishes.
12. We rarely have a corral. I wish somebody would figure out a better way of tying horses up at night.

Region 4, Bridger NF, Jim Bridger RD

1. I tried to set up a grocery store for dehydrated food within the Service and buy the stuff bulk from the company. That thing turned into a nightmare and I dropped it because of the legal paperwork, special permission, etc.
2. They prefer that old sheepherder's stove--at least the oldtimers. They use it to make biscuits, keep the chill out of the tent each morning even though it was more work than the propane stove.
3. They often use their own personal sleeping bag. Most of them are better than anything we can supply them.

4. They hobble the horses and leave them out all night but usually catch the troublemakers and tie them up all night and leave the remainder of the stock floating around the pasture.
5. Just tie up your trouble horses and you're pretty guaranteed that you will have horses in the morning unless a storm comes up to move them out or something like that.
6. We buy their GSA stuff and treat all the tents each year before they go out into the field and if we don't have time we send 2 or 3 gallons with the fellow and tell him to put it on after the tent is erected.
7. We have had pretty good luck with GSA tents but they are so heavy.
8. We have used 7x7 tepees. Sometimes you get 2 trail crew guys who really don't get along with each other and they will insist on taking 2 tepee tents. They both want one to sleep in. If they like each other they will store, sleep, and cook all in the same tent.
9. In the morning at that elevation (about 9,000) it's pretty damn chilly. You might get a snowstorm in the middle of July.
10. We bought 5 catalytics and set them up one summer and the fellows kind of liked them but for some reason they fell out of favor.
11. Invariably each new man breaks a can of white gas getting it in and he gets it all over everything and it is usually groceries.
12. We have used more propane stoves because it is safer than gasoline.
13. We bought a Safari Lite to try out. We loved it, but they cost \$30 a unit plus the cost of extra batteries. Quite a lot of dough just for a light.

Region 4, Challis NF, Challis RD

1. If you feed only pellets the horses have a terrible urge to nibble everytime you let up on the reins.
2. Pretty near every day packs are opened and repacked.
3. We are having a hard time finding a kitchen box. No one seems to build them around here.
4. New packing equipment could sure save a lot of wear and tear on the poor packer.

5. We tie the horses up at night and then the packer gets up at daylight to turn the horses loose.
6. The packer is working long before 0800.
7. When they want to take a bath they go to the creek.

Region 4, Payette NF, New Meadows RD

1. We move from waterhole to waterhole.
2. Generally just move from one drainage to the next.
3. We have some trails like the hub of a wheel so we set the camp at the hub.
4. We have to locate camps where a copter can pick them up.
5. Generally they don't set up the tent.
6. One thing that would really help out would be a square cooking kit instead of everything round.
7. Your groceries will probably weigh 125 pounds.
8. A griddle of aluminum is not much good for frying.
9. They like pop mostly.
10. We have to provide some of them with a list. They don't have the least idea what to take. They never bought anything but a hamburger.
11. The packer is the only one that knows anything about cooking.
12. Wood is not a problem on this Forest.
13. They're interested in setting up a tent as quickly as possible.
14. It would be an advantage to reduce the bulk and weight of the tent.
15. No, we haven't packed any chairs.
16. We hobble the bell mare. The mules would go to hell for the bell mare.
17. Sometimes they'll put up bars on the trail.

Region 4, Payette NF, Big Creek RD

1. Basically does most of the cooking and most of the packing. He gets a little help.
2. They are always on per diem.
3. Per diem is probably my biggest obstacle in getting efficient organization at Chamberlain.
4. I defy you to pour \$15 worth of groceries through 3 men in 1 day.
5. Sometimes I wonder just how good they eat.
6. Just too much of a temptation here to open a can and gobble it down cold.
7. On occasion she has weighed out a grub order but it has never been too satisfactory.
8. They act as though the grocery store is right around the corner.
9. We have two backpackers on the lookout that aren't the least bit interested in our old grub boxes, our old sheepherder's stove and this type of stuff. These people order a dozen or so boxes that are well planned and all sealed up and that's it for the summer.
10. I don't advocate anybody tying their horses up unless they've got some sort of subsistence for their stock.
11. We are selecting campsites based on grazing, not work. We set up camps for several days at a time.
12. I think it would be the preference of the crew to have wood.
13. I never could cook anything in aluminum.
14. You can't drink out of an aluminum cup--everybody knows that.
15. We haven't really set criterion on sleeping bags--they furnish their own.
16. That is what I've found with this type of table. Either that or it is made out of stuff about as heavy as a tobacco can.

Region 5, Los Padres NF, Santa Maria RD

1. It is easier to pack in the small Butane bottles rather than have these guys running all over everywhere trying to build an open fire to cook on.
2. The condition of that camp has a lot to do with the morale of that crew and its production. If they can come in and there are a few folding chairs, where they have a good stove, good cupboard, good warm tent, etc., it shows out on the ground.
3. When you turn your horses loose you'll have a problem catching them in the morning. There is no way that you can confine them with drift fences. They could be 5 miles down the river or upstream the next morning or go home. If you tie a wrangle horse up you're not going to get much sleep because he is going to be hollering, screaming and pawing for the rest of the horses.
4. The areas of natural grass are up on benches off the river, where some of our drainages are narrow and you can't find the feed for them.
5. The frying pan is in this pack box, the coffee pot is over here, the dishes, knives and forks are back down at the Ranger Station because somebody forgot to put them in.
6. I have only seen kitchen boxes where commercial packers were involved. On this Forest a forest packer had a small one that set inside the pack box but it was similar.

Region 6, Mt. Baker NF, Darrington RD

1. Three-burner Coleman stoves are difficult to pack.
2. Want to buy a new tent but have no guidelines to use in evaluating commercial tents. Ordered a tent for trail crew from Sears Catalog.

III. TRAVEL

Region 1, Bitterroot NF, Magruder RD

1. You put your trail crew on horseback and they won't get off--brushing, kicking rocks, opening water bars. They don't catch the little things that start your erosion problems.
2. You've got to pack oats, you've got nose bags, hobbles, shoeing equipment--by the time you get it all together it makes a mule load.
3. At the end of a 10-day hitch we have to truck our stock back to the station or to Paradise Guard Station. The way that we are situated there aren't a lot of places that they can come out. We've only got 77 miles of road on the whole District (and over 600 miles of trail).
4. We pack at least 1 load of oats and then we pack it in the gunnysack.
5. Any crew that we have out would be set up pretty much the same but sometimes they have dynamite and if you have dynamite you've got 500 feet of cord, you've got caps so no one trip is the same.

Region 3, Tonto NF, Div. of Engineering

1. We have to pack drinking water.
2. He is forced to set camp and be 4 hours from his work.
3. There is a lot of backtracking involved--always a lot of dead-heading.
4. We have many areas on this contract where there is no grazing available, they have to pack their horse feed in.
5. Nothing that involves horse travel looks efficient to me. It's gruesome. To me a horse operation is a monstrosity, tax payers' money down a rat hole.
6. Then you have to have tight fuel containers, if it leaks it eats up the horses.
7. We use propane, maybe it is the best way to go, maybe there is a better way--I don't know.
8. The kind of horse we need is not the kind we get.

9. I am concerned about putting my engineers on horses that are rambunctious. They often are not competent horsemen.
10. Rangers sometimes think it is a joke to give an engineer a wild horse.
11. Panniers can be too long and too wide.

Region 4, Bridger NF, Jim Bridger RD

1. The earliest we could get our trail crew into the wilderness and operating would usually be the 2nd week in July.
2. On the Bridger very few, even the natives, don't know what a mantaed load is, everything is done with their pannier boxes even on the Decker packsaddle. They are not using the Decker for what it was designed for.
3. We never could afford a full-time packer. We wanted one but we acted as the packers. The District Forester was, in essence, the packer.
4. There are so many theories on what to use for horse blankets or pads that I hate to give my opinion on it.

Region 4, Challis NF, Challis RD

1. At the end of the 10th day we have to have a place to leave the horses.
2. The only reason we carry 100 pounds of pellets is to catch the horses.
3. Every time something goes wrong with the saw it takes 2 days to come out.
4. If you don't have everything you need you might have to ride a whole day to get something.
5. The animals pack all day so you can carry only 150 pounds.
6. Sometimes the horses won't stay.
7. Sometimes they will go up to 5 miles with hobbles.
8. The Decker came when the Forest originated, but they require a little maintenance each year.
9. Improper padding will really eat a horse's back.

10. It takes too many trips to move horses with a horse trailer.
11. When we went to a bigger truck we couldn't get around sharp corners in the road.
12. Three miles from camp isn't far to ride because a pack string can travel 3 mph.
13. I don't see where new equipment would save a heck of a lot, not the way we're doing it now.
14. New packing equipment could sure save a lot of wear and tear on the poor packer.
15. After walking 6 miles most crewmembers would not be productive.
16. It saves the government money by having a packer that knows how to shoe.
17. We ordered shoes from everyplace--we got the lousiest kind of shoes.
18. We may need supplemental horse feed in the future--not now.

Region 4, Payette NF, New Meadows RD

1. We don't want to spend too much time walking.
2. It's frequently a day's trip from camp to the end of the road.
3. I know a sheepman in Nevada who had a burro. It doesn't require food and that would be an ideal setup if you could get people to do it.
4. Some burros are afraid of water.
5. We have a few sets of pack boxes that we make ourselves out of plywood.
6. The packer does our shoeing here.
7. We use deer hair pads.
8. We take grain all the time for goodies.
9. You couldn't improve the Decker.
10. I'm pretty well sold on the Decker.

Region 4, Payette NF, Big Creek RD

1. We have to deadhead it about a half day.
2. For instance, this trail here--you've got to travel 18 miles before you can find a place to turn a horse out.
3. You can't always get horses to eat alfalfa pellets and things of that nature.
4. Like Larry is doing all the shoeing which I consider a hell of a job.
5. Sixty-five pounds is usually enough in the neighborhood of a side pack here anyway.

Region 5, Los Padres NF, Santa Maria RD

1. When travel time is getting to be an hour or better we move the camp closer to the job.
2. All of the material we use in cribbing, such as 4x4 pressure treated timbers, has to be packed in on mules.
3. Some of these guys, no matter how many times you show them how to tie a box hitch or diamond hitch, they still never get it on right.
4. Anything over 6 feet in length is hard to pack.
5. The animals we select have to be thoroughly gentle, etc., which sometimes are not the best riding because they are slow and lazy.
6. We ordered a packsaddle from a catalog--it looked great in the picture but when we got it it was for a burro. If we had a good source for a good Decker packsaddle we could order one.
7. Butane bottles are awkward stuff to pack in. They are round and if you're not a pretty good packer you have a heck of a time lashing the load down.
8. Anytime that you start packing downhill that's when the true test comes how well you packed your load.
9. There are so many times a guy is going to be caught loading alone. Whatever we have he ought to be able to snap it on there to pack it alone. Otherwise it is not worthwhile.
10. You are always sweating out a rough piece of trail and if something comes off or you get into a jackpot then you have to tough it out on your own.

11. It would be difficult for a man to take what he needs into that country to do his job just on his back.

Region 6, Mt. Baker NF, Carrington RD

1. We have had occasion where they've backpacked themselves in sometimes.
2. Until you hit Alpine country you are either traveling on a trail or you are not traveling.
3. Gas cans are difficult to pack. Leaks white gas on food and equipment.

IV. ADMINISTRATION

Region 1, Bitterroot NF, Magruder RD

1. We do a certain amount of planning of stuff they take with them but how they eat and when they eat is up to them. When they pack up some of the kids would fill 4 mule loads because they think they need that much food.
2. People that go on trails don't have to pay for the meal costs so this is an incentive and so we really hear a lot of grumbling about the time they spend cooking on this kind of thing.

Region 3, Tonto NF, Div. of Engineering

1. The Districts were on their own after the funds were allotted.
2. The engineers were very unhappy with the quality of maintenance.
3. With 7 Districts it is going to be a problem having uniform maintenance.
4. The mechanics of writing a trail maintenance specification is difficult.
5. Some of the trails haven't been maintained in years.
6. The Rangers wanted to go out and get all these really bad trails, see, but the engineers fought for maintenance of the constructed trails to protect the money invested.
7. We go out and estimate what we can afford--not what we need.
8. We paid \$65,000 for a trail that we could have done under \$30,000, I think, if we could have used trail equipment.
9. Contract administration for maintenance runs 25-30% because we can't quantify it easily.
10. A handbook won't solve all the problems we have.
11. The quality of this condition survey varies with Districts.
12. Somewhat steep to some guys might be 60%, some might say 15% is somewhat steep.
13. The condition survey at least forced the Districts to go over trails they may never have been on before.
14. A lot of trail maintenance is subjective.

15. What are you going to do--You are faced with the problem of sending a guy out there who is a horseman but who is not an engineer, not a technician in any sense; he doesn't know how to get the job done. He doesn't know what it requires. The other alternative is to send the technical man and know the risk is high that he will get hurt.

Region 4, Bridger NF, Jim Bridger RD

1. Logically you should have the men ready by the middle of June. Give the men a chance to work and tune up a little bit. After 9 months of college they are weak and flabby but we take them right out of the classroom and bam, right out in the woods.
2. We expect trail people to do those jobs considered safe during a rainstorm. In most cases they come with inadequate rain gear and it costs you time and money because the kid is running back and forth looking for something dry or he is so miserable that he is only putting out 2 kw instead of 4.
3. Trails in the Bridger Wilderness weren't constructed--they were just like a game trail--some with deep ruts and 90-95% of these are the type that you would never be able to use horse drawn equipment on.
4. You know how to get a trail crew oriented and trained, we just kind of kicked them out the door if things were tough that year.

Region 4, Challis NF, Challis RD

1. If we don't plan, we have a lot of dead time.
2. We try to get a real good kid to break in with the crew but sometimes we don't have that luck.
3. It's hard to predict what the workload is, and if you don't have people that have a little bit on the ball and want to do a good job, and doesn't know something about pack strings, then you are in trouble.
4. There are a lot of these trails that nobody rides until hunting season so we don't have any feedback on trail conditions.
5. Every year we go out with a new saw--then keep one that is dependable.
6. We find it difficult to find a GS-3 that has much on the ball.
7. Packers are hard to come by and we need a career ladder.

8. Our packer doesn't like the extra hours and supervisory role for only 50 cents more than his workers per hour.
9. Very few of our 2,000 miles have been located and constructed to engineering standards.
10. Trail life could be quite a problem for someone who has never lived that way.
11. Lots of times a new crewmember doesn't want to come back.
12. It's hard to manage trail personnel if you don't know anything about the job.
13. If we do more to the tread we are going to encourage more bike use.
14. The whole operation evolves around one key experienced man.
15. Most people scream about light brush that does nothing more than put dew on your boots.
16. We need the money to continue the old expensive methods.
17. People just have to realize it is going to cost more to maintain these trails.
18. Most of our complaints come from outfitters.
19. We would like to have a standard about what we are doing.
20. There are a lot of people that don't understand that these horses are not up to hoyle, they like to see somebody get hurt.

Region 4, Payette NF, New Meadows RD

1. Most of the people we hire now to work on trails don't know the first thing about pack animals.
2. We don't loan mules to engineers or anyone else because they would get in trouble.
3. We hire a packer that is experienced and knows what he is doing.
4. I think packers are on their way out just like blacksmiths.
5. You can teach horsemanship, but no one higher up in our organization has been interested in it.
6. We don't have enough funds to keep a trail crew and they are fire men.

7. We keep those fellows for about 2-1/2 pay periods and that's about it.
8. One year we got \$3,000. That is the most, and we've got 287 miles worth of trail.
9. This life takes a certain type of individual.
10. Sometimes our money goes down to \$1,000 for trails.

Region 4, Payette NF, Big Creek RD

1. We don't really know exactly how many miles we do have because it's never been completely logged.
2. An awful lot of trail maintenance is contributed by fire control.
3. We've got 900 miles and we are getting now just a little over \$10,000 for trail maintenance which is hopelessly inadequate for the job.
4. None of these wranglers really fully appreciate each other.
5. I built 10 miles of trail to good engineering standards. Climbed 3,000 vertical feet at 8% and we were real proud of this when we first did it but it is entirely contrary to what it is now.
6. The acme of the trail system in a primitive area is a system of game trails, they meander around, they come to a rock bluff they go over the top, you avoid cutting the trees, you go over and around roots, etc. This is just exactly the opposite of what we did in the past.
7. Apparently we are getting a different philosophy on this trail business but so far we really haven't received too much in writing.
8. We haven't received any trail construction projects or reconstruction projects for a number of years.
9. Big Creek is not too well located as far as trail maintenance goes.
10. I am sure these things are compounded by the fact that we are way back here alone where these guys haven't got a hell of a lot to think about but little details.
11. Just the backpack couple and they succeeded in opening more trail and making more tracks around that country than practically anybody I ever had at Cold Meadows.

12. I wouldn't be surprised if backpacking is the only way things are going to be done in the future, particularly if we are going to this really purist approach.
13. Besides there's \$110,000 been spent rehabilitating that damn trail over the last 6 or 8 years. So it makes sense spending more time keeping it maintained.
14. In other words, when they set up the maintenance system I don't know who done this, but we have some 3 year trails tied onto some 1 year trails.

Region 5, Los Padres NF, Santa Maria RD

1. After the fire season is over people are put to work doing trail work rather than laying them off.
2. When the fire season begins, men are pulled off trail crews and go to the tanker stations. So the money is the tail that wags the dog sometimes.
3. Where your country is remote, 10 and 4 is the only way to go to get any efficient work done.
4. We have about 350 miles of trail and in the past we had maybe \$8,000 or \$10,000 to do the maintenance so you see that job was way out from us. When we do hit a trail it is usually in a very heavy maintenance to reconstruction phase.
5. We are responsible to maintain all the trails but some of it we haven't touched for years.
6. The Santa Barbara District has a lot of front country trails that reach right down into Santa Barbara that is getting a lot of day use.
7. I guess they want to get away from it all so most of the use is in the wilderness.
8. We are trying to identify primary and secondary trails. Our main emphasis is on the primary and then fall back on the secondary when we feel that our primaries are in good enough condition for a few years.
9. We don't use the chain saws on weekends. We don't do it when there are people around.
10. We have to get clearance to use a Cobra drill to drill powder holes in the wilderness. That's a MUST if you are going to do any shooting.

11. I would say that on the Forest we may have only a few people-- maybe 1 or 2 that are really experienced trail foremen. There weren't many people at all who knew what was going on. Few people who could use graders.
12. You have a steep cross slope and the trail handbook says 24-inch tread and the guy builds it and it sluffs in and you've got 12 inches of tread a week later. It doesn't elaborate on anything.
13. We have a lot of slide areas, loose sidehills. You can put a trail in there but it won't stay very good unless you crib it up. Everything that we have used we had to invent. If we had a handbook you could give your foreman to help him visualize the concept of what he has to do, it would simplify everybody's job because we are always retraining people.
14. Our kind of cribbing evolved through trial and error and it cost us money, mainly because we didn't have any guidelines, so now we are experimenting on our own and getting it done to what will work and what won't work.
15. We don't have any packers designated as such. The Ranger, resource assistant, forester can pack. If you had a packer when he is through packing what do you do with him.
16. We had 5 men on this District that could pack but as they graduated up they went to other jobs. That leaves inexperienced men with the animals.
17. During fire season packers go to their station and then you've got inexperienced people handling stock. You get injured stock, a lot of spoiled and barn-sour stock. Your experienced packers are all doing other things at better paying jobs because they have families.
18. You can't make a horseman in 2 days or 2 weeks or in a month. It takes a lifetime to train him to call him a good or qualified horseman.
19. We can teach basic safety around horses.
20. We ordered a packsaddle from a catalog--it looked great in the picture but when we got it it was for a burro. If we had a good source for a good Decker packsaddle we could order one.
21. In the past people were real reluctant to buy you new packsaddles or new panniers merely because you wanted them. They'd say, "Now wait a minute, if you buy new packsaddles and panniers that's one pay period for 1 man. Maybe we better do with what we got and get that money out on the ground."

22. Because of the flood we got emergency funds for reconstruction that allowed us to buy new equipment. Previously some of the packers were using their own equipment because we had nothing.
23. Some of this pack equipment that they use in the military in some places we could use very effectively if we knew about it and had some of it.
24. The equipment that Will has is a little better because he was more interested in his operation in the field than some Rangers. Some of these places were no more than just Hippy camps where the crew was staying.
25. When I first came here some of the camps I saw the Hippies were living better than they were. The people who were in charge of this would say "Oh, they don't need all that stuff. When I first started here and was building trails we didn't have all that." These guys would go out there and shrug their shoulders and they got just what they paid for.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1978-796-058/103

R0000 704052



R0000 704052

